THE GENERAL BOARD

United States Forces, European Theater

ENGINEER ORGANIZATION

MISSION: Prepare Report and Recommendations on The Engineer Organizations Within A Field Army.

The General Board was established by General Orders 128, Headquarters European Theater of Operations, US Army, dated 17 June 1945, as amended by General Orders 182, dated 7 August 1945 and General Orders 312, dated 20 November 1945, Headquarters United States Forces, European Theater, to prepare a factual analysis of the strategy, tactics, and administration employed by the United States forces in the European Theater.

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ENGINEER ORGANIZATION

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CHAPTER 1

INTRODUCTION

1. Purpose and Scope. Combat operations in the European Theater of Operations during World War II have demonstrated certain deficiencies in the present engineer organization within a field army. The purpose of this study is to determine the most effective engineer organization for future operations. The controversial and important subjects of the engineer command and the group versus the regiment are considered separately in chapters 2 and 3. The conclusions and recommendations of these chapters provide a basis for review and suggested modification of type engineer organizations in chapter 4. Finally, based on the type engineer organizations recommended, there is developed in chapter 5 a table of troop allotment for a type field army.

2. Aviation Engineers. As this study has been limited to consideration of the engineer component of a field army, no attempt has been made to discuss or evaluate the problem of engineer organization as it applied to engineer aviation units. In the European Theater these units were assigned integrally to the air force. The air force did evolve a unique method of engineer control, creating an independent and self-sustained engineer organization (the IX Engineer Command) which furnished a practical field test of many of the qualities of the engineer command organization discussed in chapter 2 of this report. No single publication gives details of that organization but the most pertinent accounts are:

a. The History of IX Engineer Command.

b. Ninth Air Force Invasion Activities.

c. Development of Organization and Operating Procedures of the Ninth Air Force in the European Theater of Operations.

d. Section entitled "Aviation Engineer Operation on the European Continent, 6 June 1944 to 9 May 1945", of report by Army Air Forces on "Effectiveness of Close-In Air Cooperation".

CHAPTER 2

THE ENGINEER COMMAND

3. Purpose. The purpose of this chapter is to determine the doctrine which should govern the command and staff functions of army and corps engineers.

4. Present Doctrine.

a. Paragraph 3, AR 100-5, 12 February 1943, states: "*** The unit engineer will be a member of the staff of his commanding officer. He will be charged, under the direction of his commanding officer, with the command of such portions of the Corps of Engineers belonging to his unit as are neither placed by competent authority under some junior commander, nor assigned to some subordinate tactical unit containing other than engineer troops ***."

b. When FM 5-5, 11 October 1943, was issued, paragraph 23b read: "The army engineer is a member of the special staff of the army commander and commands all engineer units assigned or attached to the army. He also commands engineer supply establishments within the army area that are not controlled by higher headquarters." This was superseded by Change 3, 5 July 1944, which states: "The army engineer is a member of the special staff of the army commander. He assigns missions to the army combat groups in accordance with orders of the army commanding general. He may also assign tasks considered essential to the engineer mission. He designates the location within the army area of engineer supply establishments not controlled by higher headquarters."

c. Likewise in FM 5-5, paragraph 21c (1) read: "The corps engineer is a unit engineer. He commands all engineer troops assigned or attached to the corps and is a member of the staff of the corps commander." This was superseded by Change 3, 5 July 1944, which reads: "The corps engineer is a member of the corps commander's special staff. As such he does not command engineer troops assigned or attached to the corps, but transmits to the group commanders the orders of the corps commander that affect the operations of corps engineer units."

d. Also, in FM 5-6, 23 April 1943, paragraph 3b stated: "An engineer officer is provided on the staff of the commander of each division or other large unit. In addition to his staff functions, this officer commands all engineer troops not assigned or attached to subordinate echelons. ***" This was superseded by Change 4, 16 December 1944, which reads: "An engineer officer *** other large unit. In the division, this officer, in addition to his staff functions, commands organic engineer troops not attached to subordinate units. In corps and higher echelons, he acts only as a special staff officer and has no command function. *** "

e. Basic staff doctrines and functions are considered in FM 101-5, 19 August 1940.

(1) In paragraph 2a the functional chart for command and staff procedure shows three command channels emanating from the commander, direct in each case to the general staff, to the special staff, and to troops.

(2) Paragraph 6a notes that: "A staff officer as such has no authority to command. *** "

(3) Paragraph 18b, however, points out that special staff officers have dual functions when they also command troops: "In certain cases, special staff officers are also commanders of troops or heads of technical, supply or administrative services, and as such have the usual functions of command or control over such troops or services; for example, the commander of the artillery troops of an infantry division is also the division artillery officer. These two functions of staff and command, although vested in a single individual, are separate and distinct in that each involves different responsibilities and duties, and the exercise of one should not be confused or permitted to interfere with the exercise of the other. On the contrary, this dual function of certain officers has many advantages in facilitating the proper discharge of both staff and command duties of the officers concerned."

5. Contradiction and Ambiguity in Established Doctrine.

a. The exact functions of army and corps engineers are uncertain because of the contradiction in written doctrine. They are given command status in AR 100-5 and denied it by the changes made in FM 5-5 and FM 5-6. The functional chart in FM 101-5 can be interpreted to permit either alternative. Paragraph 18b of the same manual contemplates the dual function as special staff officer and commander although it does not specify to which special staff officers this applies.

b. In FM 5-5 ambiguity is caused by insufficient definition of the function of the army engineer when "he assigns missions to the army combat groups in accordance with orders of the army commanding officer", and of the corps engineer who "does not command engineer troops assigned or attached to the corps, but transmits to the group commanders the orders of the corps commander".

6. Operational Control. The term operational control was utilized in recent practice to designate control without complete command. This term has been used to describe the control special staff officers exercised over their troops and also to describe the original conception of the relation of a group to its attached sub-units over which the group exercised control of operations without administrative responsibility.

7. Engineer Command in Practice.

a. First Army. The terms "command" and "operational control" were defined in First Army Staff Memorandum No. 24, 18 March 1944, which stated: "Command insofar as it pertains to the First Army can be defined in two categories:

(1) "Complete command, which entails all the prerogatives of a commander as described by Army Regulation 600-20.***

(2) "Operational control, which entails those prerogatives of a commander delegated to an individual to enable him to direct, control, and coordinate the

activities of a large number of units, and at the same time relieving him from the maximum of administrative responsibilities."

(3) Operational control authority was delegated to special staff section chiefs. The functions delegated to them to exercise over the troops of their branch were in part as follows: Normal operating orders issued direct to subordinate army units in the name of the army commander; training directives; reallocation of supplies; recommendations for transfer of personnel for which orders would be issued automatically except in unusual cases; and recommendations on efficiency reports, promotion, decoration and reclassification of personnel, for which it was provided that "*** all documents of this nature will be routed to G-1, who will note them and immediately circulate them to the special staff section concerned prior to general staff or command action."[1]

b. Third Army. The Third Army Engineer operated under a very similar procedure. The army engineer did not command, but did exercise operational control. All operational instructions were issued in the name of the army engineer. Operational control was not defined.[1]

c. Seventh Army. In Seventh Army practically all engineer operational orders were issued through technical channels and it was urged that this be recognized as the proper medium. Personnel matters were considered so intimately connected with operations, troop welfare and morale, that they should pass through the engineer, to whom in any event they must be referred by G-1 for proper handling. Operational control was not defined.[2]

d. Ninth Army. The Ninth Army Engineer Standing Operating Procedure, 8 July 1944, established: "Under the direction of the Army Commander, the Army Engineer exercises operational control of all Army Engineer troops." Operational control was not defined.[3]

e. Fifteenth Army. The Fifteenth Army adopted procedure similar to the First Army in respect to the delegation of operational control authority to special staff section chiefs.[4]

f. Corps. Sixteen corps engineers were questioned.[5,6] All stated that they commanded corps engineer troops either definitely or in effect. It was noted that the older corps provided more nearly for the exercise of complete command, while in the newer corps the status was less definite and more varied. All but one corps engineer advocated complete command.

8. Types of Command Exercised.

a. Operational Control. The foregoing summary of the engineer command in practice shows the development of a procedure made necessary by the amended doctrine. Change 4 to FM 5-6 specifies that the army and corps engineers have no command function. Change 3 to FM 5-5 provides only that the army engineer "assigns missions to the army combat groups in accordance with orders of the army commanding general", and that the corps engineer "does not command *** but transmits to the group commanders the orders of the corps commander ***",

It is clear that most commanding generals held their unit engineer responsible for engineer operations and attempted to empower the engineer with the needed authority by some device such as operational control. In most cases this control closely approached complete command either by means of authority delegated the engineer to issue orders in his superior's name or by the use of technical channels for distribution of directive information equivalent to orders. As elaborated below, it was also found to be necessary to route or refer to the unit engineer personnel and administrative matters pertaining to engineer troops. Because of different personalities and interpretations there was variation in the extent of control exercised by the unit engineer.

b. Complete Command. In accordance with doctrine, not affected by Change 3 to FM 5-5 or Change 4 to FM 5-6, the division engineer retained complete command of his troops. In at least two instances a corps order was issued definitely placing the corps engineer in command of all corps engineer troops.[7]

9. Reasons for Variation in Command. Several factors caused the variation in the type of command or control exercised.

a. Contradiction and Ambiguity in Doctrine. Contradictions and ambiguity in the printed doctrine have been pointed out above.

b. Lack of Definite General Staff and Special Staff Relationship. Doctrine and teaching inadequately establish the precise relationship to cover the exercise of functions of the general staff which may affect the interests of the special staff section chiefs.

c. Personalities. Differing personalities cause variations in staff functioning, a condition which can be mitigated by definitive doctrine and teaching. Some variation in detail due to personalities involved is both unavoidable and desirable.

10. Engineer Administration.

a. In the early part of World War II new concepts in organization were introduced to provide flexibility. Groups in various arms and services were created with no administrative authority.[8] With the advent of non-administrative groups, the independent battalions and special companies were visualized as being administered directly from corps or army. The impossibility of higher headquarters working effectively with so many units from the various arms and services was soon demonstrated. There were too many small units, many highly specialized, to deal efficiently with the general staff, or to be commanded personally by the commanding general. All groups by necessity now do have considerable administrative authority.[9] In general practice engineer administrative matters going up were assembled by the unit engineer for the general staff section concerned and were either routed through the unit engineer or referred back to him by the general staff section. The changes which removed his command authority were intended to remove the unit engineer's administrative burden as well. This intent was not achieved. The unit engineer could not avoid being concerned with administrative matters effecting his engineer troops; administrative orders issued without reference to or concurrence of the unit engineer were capable of seriously affecting engineer operations.[6]

11. General Staff and Engineer Relationship.

a. Staff Teams. Attempts were made in some headquarters to set up staff teams.[5] At times engineers were on the G-3 team; at other times on a G-4 team. Engineers, by the nature of their duties, must work closely with G-2, G-3, and G-4. At times G-3 interests dominate; at times G-4. G-2 contacts are less dominating, but do occur repeatedly. To tie engineers to one staff section is to overemphasize one phase of their activities at the expense of the others.

b. Multi-headed Command. Lack of a command authority heading the engineers subjected engineer troops to receiving orders from several sources when various sections operated without reference to the unit engineer.[6] There were many examples of this. An army G-1 ordered a corps battalion direct to transfer an officer by name to command a heavy ponton battalion; the officer had no ponton training, but was an excellent supply man; another officer was available who was well qualified for the position vacancy. G-2 ordered a topographic company direct to print maps which the corps engineer had previously arranged to secure from army. G-3 ordered a battalion direct to proceed to a distant location; the battalion was in the midst of the highest priority work, and another battalion was available.

c. Establishment of Staff Doctrine. In the great majority of cases, unit engineers eventually worked out cordial and effective relationships with the general staff. Confirmation in doctrine of the most efficient policies should enable a new staff to fit together quickly and smoothly.

12. Recommended Command Doctrine.

a. Operations. The unit commander holds his unit engineer responsible for the accomplishment of the engineer mission in the unit area. Responsibility requires adequate authority. Development of the practice of allowing the unit engineer as a special staff officer to have "operational control" was an instinctive correction of a basic misconception. However, operational control has the weaknesses of partial command. Complete command places full authority and responsibility in the unit engineer. Army and corps commanding generals, by some device, tended to give their unit engineers the maximum authority possible and held them accountable for results.[7] This same principle was developed by concurrence between general staff members and unit engineers.[7] The subject has been studied by the Chief Engineer, European Theater of Operations, who has reached similar conclusions.[10] Necessity for an engineer command higher than group is recognized in principle in an unnumbered War Department Circular, dated 19 January 1943, (AG 320.2) (1-15-43) which states in part, "the brigade organization is retained for the command of a number of groups."

b. Administration. Although almost all commanding officers would like to be relieved of the burden of administrative detail, control of administrative matters is a necessary part of command authority. Administrative procedure should be simplified but not at the expense of weakening command.

13. Changes Involved.

a. Division. To confirm the lessons learned in practice, no change is necessary within the division as to command practice. The division engineer now has definite command responsibility as well as staff duties.

b. Corps. Within the corps, The Engineer Command, Corps, (in some recommendations called a brigade) should be authorized and

should provide the corps engineer with a sufficient number of qualified personnel to perform the function of command.[11] Reports indicate the present staff is too small to accomplish even its present mission.[12]

c. Army. Within the army, The Engineer Command, Army, should be authorized with facilities adequate for command responsibilities. This can be accomplished with no significant changes in personnel.[13]

14. The Engineer Command and the Engineer Special Staff Officer. Two different functions are represented in the positions of the engineer special staff officer and the unit engineer commander. The officer most competent to fill one position is the officer best informed on developments in the other. Rather than to have two officers, the same officer should fill both positions. Paragraph 18b of FM 101-5, cited above, notes that this dual function "*** has many advantages in facilitating the proper discharge of both staff and command duties of the officers concerned". When necessity demands, the utilization of a deputy or executive officer for one of the functions is possible under existing regulations.

15. Conclusions.

a. The army and the corps engineer were not vested with command, but in practice exercised such control over army or corps troops that actual command was closely approached.

b. Because of lack of proper doctrine guidance, methods of exercising this control varied. The results sought were similar: to allow authority necessary for the responsibilities involved.

c. Change 3 to FM 5-5, and Change 4 to FM 5-6, are contrary to other printed doctrine and contrary to practice in war.

d. The lessons learned can best be confirmed by the authorization of a definite Engineer Command, in both army and corps.

e. Methods of simplifying administrative work should be sought, but not by separation of command and administrative control.

f. When the same officer exercises both staff and command functions, there are advantages in facilitating the proper discharge of both staff and command duties.

16. Recommendations.

a. That there be authorized The Engineer Command, Army, and The Engineer Command, Corps, commanded by the army engineer and the corps engineer, respectively, to exercise engineer command functions, including administration.

b. That in army, corps, and division, the unit engineer exercise both command and special staff functions.

c. That the pertaining paragraphs in Change 3 to FM 5-5 and Change 4 to FM 5-6 be rescinded to reauthorize the exercise of command function by the army and corps unit engineer as was established in these manuals prior to these changes; and that other War Department or Service School publications be corrected accordingly.

BIBLIOGRAPHY

Chapter 2

1. WD Observers Board, Hq European Theater of Operations, AGF Report No. 1137, by Colonel Chester C. Hough, CE, subject, "Command and Staff Procedure - Army", dated 31 July 1945.

2. Report of Engineer, Seventh US Army, subject, "Lessons Learned During Operations in France and Germany", dated 12 July 1945.

3. WD Observers Board, Hq European Theater of Operations, AGF Report No. 1063, subject, "SOP Ninth Army Engineer Headquarters", dated 30 June 1945.

4. Staff Memorandum No. 16, Hq Fifteenth US Army, 31 January 1945.

5. WD Observers Board, Hq European Theater of Operations, AGF Report No. 1136, by Colonel Chester C. Hough, CE, subject, "Operation of Special Staff Sections of Corps Headquarters - Engineers", dated 31 July 1945.

6. Appendix 1. (Statement of Corps Engineers).

7. File 320.2/36, "Engineer Organization", Engr Sec, The General Board, US Forces, European Theater.

8. Paragraph 7b, Circular No. 256, WD, "Reorganization of Corps Headquarters and Organic Troops", dated 16 October 1943.

9. Circular No. 439, Section I, WD, "Flexibility of Organization", dated 14 November 1944.

10. Appendix 2. (Consensus of Engineers).

11. Appendix 3, Chapter 4, "Headquarters and Headquarters Company, Engineer Command, Corps".

12. WD Observers Board, Hq European Theater of Operations, AGF Report No. 675, by Colonel Chester C. Hough, CE, subject, "The Corps Engineer Section", dated 21 February 1945.

13. Appendix 7, Chapter 4, "Headquarters, Engineer Command, Army".

14. War Department Circulars.

15. Army Regulations.

16. FM 5-5, Engineer Troops, 11 October 1943.

17. FM 5-6, Operations of Engineer Units, 23 April 1943.

18. FM 101-5, Staff and Combat Orders, 19 August 1940.

APPENDIX 1
Chapter 2

STATEMENT OF CORPS ENGINEERS

1. a. At a meeting of corps engineers held in Bad Nauheim, Germany, 26 September 1945, the following were present:

(1) Colonel W. N. Thomas, Engineer, VI Corps.

(2) Colonel Clyde E. Dougherty, Engineer, XII Corps.

(3) Colonel Warren N. Underwood, formerly Engineer, XV Corps.

(4) Colonel Hubert S. Miller, formerly Engineer, XIX Corps.

(5) Colonel John C. Arrowsmith, Engineer, XXI Corps.

(6) Colonel Robert J. Fleming, Jr., formerly Engineer, XXII Corps.

(7) Lt Colonel A. B. Fennell, Engineer Executive Officer, XXIII Corps.

b. All of the above agreed that:

(1) They commanded either definitely or in effect all engineer troops within their respective corps.

(2) There had been examples in each of their respective corps where engineer troops were, in effect, receiving orders, including administrative orders, from several sources without reference to the corps engineer.

(3) In general practice, administrative matters going up were assembled by the corps engineer for the general staff section concerned and such matters coming down disseminated through him.

2. Letters were received by the Engineer, The General Board, United States Forces, European Theater, from the following corps engineers in which each stated that he commanded either definitely or in effect all engineer troops within his respective corps:[7]

a. Colonel L. B. Gallagher, formerly Engineer, II Corps.

b. Colonel F. R. Lyons, formerly Engineer, III Corps.

c. Colonel Lewis C. Patillo, formerly Engineer, V Corps.

d. Colonel F. S. Tandy, formerly Engineer, XX Corps.

APPENDIX 2
Chapter 2

CONSENSUS OF ENGINEERS

Copies of the study on the Engineer Command were referred to various engineers for comment. Signed statements have been received by the Engineer, The General Board, United States Forces, European Theater, in which the following concurred with the conclusions and recommendations outlined in this study:

1. Major General C. R. Moore, Theater Chief Engineer, European Theater of Operations.

2. Brigadier General B. C. Dunn, formerly Chief Engineer, Supreme Headquarters, Allied Expeditionary Forces.

3. Brigadier General Henry C. Wolfe, formerly Engineer, 6 Army Group.

4. Brigadier General P. H. Timothy, formerly Engineer, 12 Army Group.

5. Brigadier General Richard U. Nicholas, formerly Engineer, Ninth US Army.

6. Brigadier General G. J. Nold, formerly Engineer, Tenth US Army.

7. Colonel W. A. Carter, Jr., formerly Engineer, First US Army.

8. Colonel L. E. Gallagher, formerly Engineer, II Corps.

9. Colonel F. R. Lyons, formerly Engineer, III Corps.

10. Colonel Lewis C. Patillo, formerly Engineer, V Corps.

11. Colonel W. N. Thomas, Jr., Engineer, VI Corps.

12. Colonel Charles Keller, Jr., formerly Engineer, VIII Corps.

13. Colonel Clyde E. Dougherty, Engineer, XII Corps.

14. Colonel Warren N. Underwood, formerly Engineer, XV Corps.

15. Colonel Hubert S. Miller, formerly Engineer, XIX Corps.

16. Colonel F. S. Tandy, formerly Engineer, XX Corps.

17. Colonel John C. Arrowsmith, Engineer, XXI Corps.

18. Colonel Robert J. Fleming, Jr., formerly Engineer, XXII Corps.

19. Colonel Edward G. Daly, formerly Engineer, XXIII Corps.

20. Colonel Chester C. Hough, formerly President, War Department Observers Board.

21. Colonel D. W. Griffiths, formerly Engineer Section, Supreme Headquarters, Allied Expeditionary Forces.

22. Colonel W. G. Saville, formerly Engineer Section, Supreme Headquarters, Allied Expeditionary Forces.

CHAPTER 3

GROUP VERSUS REGIMENT

17. Purpose. The purpose of this chapter is to determine the most effective type of future engineer organization within army and corps which will retain the maximum advantages of both the present regiment and group and will minimize the disadvantages of each.[1]

18. Background of Change from Regiment to Group.

a. World War I. The engineer combat regiment employed during World War I consisted of a headquarters, a headquarters and service company with organic equipment including bridging and maintenance facilities, and two dependent battalions. This fixed type of combat regiment was well adapted to the static conditions which largely prevailed during that war. The concept continued and the advent of World War II found little change in the combat regiment.

b. New Concepts in World War II. The fall of France and early campaigns in North Africa demonstrated the need for new concepts. Offensive weapons were powerful; the war was one of movement. Flexibility became the keynote. The task force was created. To provide flexibility for engineer troops above division level, new concepts in engineer organization were introduced after the United States entered the war.[2] Combat battalions capable of independent action were created. To supply the equipment formerly furnished by the headquarters and service company of the regiment, independent special units were formed. It was realized that within an army or corps it would be impractical by direct command to control battalions and special companies. These units were attached to groups, which were established as operational command headquarters without administrative responsibility. In this way an engineer "task force" of approximately regimental size was created. No permanence of units under a particular group was indicated. The independent battalions and separate companies could be shifted readily among group headquarters to meet varying operational demands.

19. Experience in Operations.

a. Regiments. Combat regiments, with either two or three dependent battalions, were operating in North Africa before the group concept was adopted. They continued to operate as regiments in Sicily, Italy and southern France before they were converted into groups in the later stages of the war. As requirements dictated, elements of special companies were attached to them, so that in a limited way they operated on the group principle. Although these regiments possessed high esprit and made outstanding records, certain deficiencies in organization were recognized. Their battalions were incapable of independent action unless supplemented with personnel and equipment from the regiment. Within the battalion no means were available for supply and reconnaissance. Communications were inadequate. The staff of the battalion, consisting of two officers and eight enlisted men, was too small for planning or supervision of operations.

b. Groups. Operations in the European Theater proved that the group was a highly flexible and effective organization. It was well suited to a war of movement. Its battalions, with their adequately staffed headquarters and their headquarters and service companies, were capable of independent operation, including planning, administration,

supply, reconnaissance and communications. The special units attached to group formed a pool of various types of equipment readily available to support the battalions as required. As utilized, however, the group did possess certain weaknesses. An outgrowth of the war, its name and organization were new. Doctrine on group tactics and functions was not well developed. The conception of the group idea was not uniform. The group commander required more administrative authority than originally planned. Shifting of units between groups was too frequent. As subordinate units were attached rather than assigned and a particular grouping of units seldom endured long, efficiency and esprit of many battalions and separate companies suffered in training and in combat.

20. Selection of Desired Characteristics. Although both the regiment and the group were able to accomplish their missions, each had certain inherent deficiencies as well as advantages. A modified organization should afford as many of the advantages as possible and avoid demonstrated deficiencies.

a. Desired Characteristics of the Modified Organization.

(1) Flexibility. The flexibility obtained by the grouping of independent units, as in the group, is desirable, but should be limited to prevent its misuse.[1]

(2) Permanence of Units. Permanence of sub-units, as in the regiment, increases ties of affiliation and loyalty, although decreases flexibility. Instead of frequent changes in attachment, units should have permanent assignment insofar as possible.[1]

(3) Economy of Force. Economy of force in use of special equipment is obtained by pooling bridge, equipment, dump truck, and maintenance companies to form independent special engineer units.[1]

(4) Command Status of Commanders. In the regiment the commander had complete command including administrative responsibility. Although War Department Circular No. 439, 14 November 1944, made the group an administrative as well as tactical unit, the command authority of the group commander is not as explicit as in the regiment. The commander should have complete command authority including administrative responsibilities.[1]

b. The Battalion.

(1) Size of Basic Unit. The bulk of army and corps engineer missions lent themselves readily to assignment to battalions on an area or task basis. The battalion is of appropriate size that it can be organized for independent operation and used flexibly.[1]

(2) Independent versus Dependent. The battalion, as the basic unit of the supporting engineers, must be capable of rapid, effective action to capitalize on the opportunities afforded by a war of movement. To support an advance, the battalion must be capable of independent operation, planning, and supply, and have adequate communications and equipment. For special

tasks it may be augmented by special units. Most corps and army engineers favor the independent battalion.[1,3,4]

(3) Number Required. For normal operations, three battalions are considered the most effective number under a common control.[5]

(4) Assigned versus Attached. If battalions are assigned, rather than attached, the position of command will be strengthened, and the relationship will have a more permanent aspect resulting in increased effectiveness, esprit and loyalty.[5,6]

(5) Designation. When a battalion is titled as a subunit carrying the same numerical designation of its higher unit, affiliation between the two is developed.[5]

c. Special Units.

(1) Utilization of special equipment was limited when it was an organic element within a larger unit. Such equipment when pooled in independent special units could be used more flexibly to meet varying situations. To obtain some permanence, the special units whose capacities are normally required by the combined subordinate units of the modified organization should be assigned to the organization, rather than attached. Other special units required for a period of time, but not normally, may be attached.

(2) Assignment of all special units to corps or army results in many small units distantly controlled. Assignment of appropriate special units to the modified organization places them under suitable command having close control. Their interests can be better considered by a headquarters having only a few subunits. Relative permanence of an assignment favors high morale and effectiveness in operations.

d. Headquarters and Headquarters Company. Both the regiment and the group possessed an adequate headquarters and staff. The headquarters and service company of the regiment differed from that of the group in that it had service and equipment elements. As independent battalions should be equipped organically with the minimum construction equipment which they require for normal operations, the modified organization should have a headquarters company but not a headquarters and service company.

e. The Name: Group or Regiment. The name selected is of secondary importance to the adoption of a suitable type organization. The term "regiment" has long military background and is a familiar title carrying prestige. It has long been used to denote an echelon of this size. The term "group" is relatively new, although now known and recognized. Its use introduces an additional term; a term whose generalized common use causes it to have indefinite significance. By redefinition and usage, regiment would become established as connoting the proposed modified organization.

21. Conclusions.

a. Neither the old regiment nor the present group is entirely satisfactory as an engineer organization within army and corps.

b. Flexibility was lacking in the regiment, and was overused in the group.

c. Complete command was not given to group commanders as explicitly as to regimental commander, especially in administrative responsibility.

d. Independent-type battalions are preferable to meet corps and army engineer requirements.

e. Three battalions are the most effective number under a common command.

f. Affiliation is developed when battalions are titled as sub-units carrying the same numerical designation of the higher unit.

g. Independent special units, such as bridge, equipment, dump truck, and maintenance companies, provide greater flexibility and economy of force than when their equipment is an organic element of a large unit.

22. Recommendations.

a. A modified organization as proposed in this chapter should be adopted to take the place of the old regimental organization and its successor, the group, as an engineer organization within army and corps.

b. The name "regiment" should be retained for this organization.

c. The commander should have complete command including administrative responsibility.

d. The modified regiment should consist of headquarters and headquarters company; three assigned independent battalions; and necessary supporting special units, assigned or attached.

e. Battalions should be numbered as the 1st, 2d, and 3d of the regiment.

f. Special units necessary to meet the normal requirements of the combined units in the regiment should be assigned to the regiment; other special units should be attached.

BIBLIOGRAPHY

Chapter 3

1. File 320, Engineer Operations, Office of the Chief Engineer, European Theater of Operations, subject, "Group vs Regiment -- Engineers".

2. Paragraph 7, Circular 256, WD, 16 October 1943.

3. Report of Engineer, Seventh US Army, subject, "Lessons Learned During Operations in France and Germany", dated 12 July 1945.

4. Letter, Hq Fifteenth US Army, file 319.1 GNMEN, subject, "Engineer Final Report", dated 7 July 1945.

5. File 320.2/36, "Engineer Organization", Engr Sec, The General Board, US Forces, European Theater.

6. WD Observers Board, Hq European Theater of Operations, AGF Report No. 698, by Colonel Chester C. Hough, CE, subject, "The Group versus the Regiment - Engineers", dated 5 March 1945.

CHAPTER 4

ENGINEER ORGANIZATIONS

23. Scope and Purpose. This chapter is a general review of the engineer organizations within a field army and includes recommendations for the correction of existing deficiencies.

24. Discussion. A general examination of the engineer organizations within a field army has revealed certain deficiencies. These are explained in detail in appendices 3 to 10 inclusive, which present separate studies of the different type units involved. In general the deficiencies should be corrected as follows:

a. Divisions. The present division engineer battalion is not adequate. The proper size for the division engineer component is considered in detail in Chapter 5.

b. Corps. The corps engineer should be provided a headquarters and headquarters company (Appendix 3) adequate to control his corps units; the light equipment company and dump truck company should be combined into a single combat equipment company (Appendix 4); the panel bridge transport company (Appendix 5) should be reorganized; and the missions of the topographic units (Appendix 6) in both corps and army should be reviewed further and the units reorganized if necessary.

c. Army. An engineer headquarters, army, (Appendix 7) adequate to control all army engineer activities should be provided, as well as a supply group headquarters (Appendix 8) and a depot battalion (Appendix 9) to supervise army engineer supply, and a map company (Appendix 10) to handle the distribution of maps.

25. The type unit organizations recommended, together with the overall organizations for corps and army outlined in Chapter 5, reduce to the minimum the necessity for elements of organizations having to operate away from their parent units for extended periods.

26. Consensus among engineers is that basics should be returned to engineer organizations and that heavy equipment operators be provided for two shifts.[1,2] Also, there is a need for inclusion of a liaison officer in the T/O of battalions and a liaison sergeant in the T/O's of separate companies.[3]

27. Answers to other questions posed in connection with this study have been considered and are included in the respective appendices mentioned above.

28. Recommendations. It is recommended that:

a. Organizations outlined in appendices 3 to 10 inclusive be approved.

b. Basics be returned to all engineer T/O's and heavy equipment operators be provided for two shifts.

c. Consideration be given to provision of liaison personnel in the T/O's of appropriate engineer units.

BIBLIOGRAPHY

Chapter 4

1. WD Observers Board, Hq European Theater of Operations, AGF Report No. 582, by Colonel Chester C. Hough, CE, subject, "Reduction in Size of Units", dated 3 February 1945.

2. File 337, Conferences, Engr Sec, The General Board, US Forces, European Theater. (See Notes on Conference of Army and Army Group Engineers held 11-12 June 1945 at Hq European Theater of Operations, US Army.)

3. File 320.2/36, "Engineer Organization", Engr Sec, The General Board, US Forces, European Theater.

4. WD Observers Board, Hq European Theater of Operations, AGF Report No. 675, by Colonel Chester C. Hough, CE, subject, "The Corps Engineer Section", dated 21 February 1945.

5. WD Observers Board, Hq European Theater of Operations, AGF Report No. 1149, subject, "Final Report of Colonel Chester C. Hough, CE, Engineer Observer, ETO", dated 31 July 1945.

6. T/O & E 5-287, Engineer Panel Bridge Transport Company, 28 June 1945.

7. WD Observers Board, Hq European Theater of Operations, AGF Report No. 899, by Colonel Chester C. Hough, CE, subject, "T/O & E of Engineer Topographic Battalions; T/O & E of Engineer Topographic Companies", dated 4 May 1945.

8. Report of Engineer, Seventh US Army, subject, "Lessons Learned During Operations in France and Germany", dated 12 July 1945.

9. Letter, Hq Fifteenth US Army, file 319.1 GNMEN, subject, "Engineer Final Report", dated 7 July 1945.

10. Part 12, Engineer, Vol II, After Action Report, Third US Army, 1 August 1944 - 9 May 1945.

11. WD Observers Board, Hq European Theater of Operations, Engineer Supplemental Report No. 23, by Colonel X. H. Price, CE, "Recommended Changes in T/O & E for Engineer Topographic Companies as th Result of Experience in France", dated 13 January 1945.

12. Letter, Hq 12 Army Group, Engr Sec, to Chief Engineer, European Theater of Operations, US Army, subject, "T/O and T/E for Army Topographic Battalion and Topographic Company", dated 30 March 1945.

13. WD Observers Board, Hq European Theater of Operations, AGF Report No. 1138, by Colonel Chester C. Hough, CE, subject, "Comments of an Army Engineer", dated 31 July 1945.

14. WD Observers Board, Hq European Theater of Operations, AGF Report No. 809, by Colonel Chester C. Hough, CE, subject, "Army Engineer Service Group", dated 5 April 1945.

15. WD Observers Board, Hq European Theater of Operations, AGF Report No. 1113, by Colonel Chester C. Hough, CE, subject, "Proposed Organization of Engineer Service Group - Army", dated 28 July 1945.

16. WD Observers Board, Hq European Theater of Operations, AGF Report No. 901, by Colonel Chester C. Hough, CE, subject, "Recommendations of an Army Engineer", dated 5 May 1945.

17. WD Observers Board, Hq European Theater of Operations, AGF Report No. 552, by Colonel Chester C. Hough,CE, subject, "Map Distribution", dated 27 January 1945.

18. Hq European Theater of Operations, Proposed Tables of Organization and Equipment, Base Map Distribution Company, Engineer Topographic Battalion (Army), and Engineer Topographic Company (Corps), dated 12 March 1945.

19. T/O & E's (5- series).

20. FM 5-5, Engineer Troops, 11 October 1943.

21. FM 5-6, Operation of Engineer Units, 23 April 1943.

22. FM 101-10, Organization, Technical and Logistical Data, 1 August 1945.

APPENDIX 3

Chapter 4

HEADQUARTERS AND HEADQUARTERS COMPANY, ENGINEER COMMAND, CORPS

1. Corps Engineer Section. The organization provided corps engineers in the corps headquarters proved inadequate.4 It was necessary to supplement it with cellular units and with temporary duty personnel in order for the corps engineer to accomplish his mission.

2. Engineer Command, Corps. It is assumed that the Engineer Command, Corps, recommended in Chapter 2, will be approved. The corps engineer should be provided with a headquarters and headquarters company adequate to perform the staff and command functions of the engineer command. This organization should include the cellular units and temporary duty personnel drawn from combat units to the detriment of their operations in the European Theater.

3. Cellular Units. The cellular units provided were a photo interpretation team and an engineer technical intelligence team (combat). Temporary duty personnel included an officer and generally twelve enlisted men who formed a provisional map distribution detachment and a varying number of additional officers and enlisted men found necessary to meet operational requirements. In addition, Headquarters, European Theater of Operations, officially augmented the T/O of the corps engineer section by two officers and two enlisted men.

4. Additional Personnel. In addition to correcting the deficiencies during current operations by absorbing the personnel found necessary under the present scheme of organization as indicated above, the proposed organization provides personnel to meet new responsibilities that fall into three categories, as follows:

a. Administrative. One officer, one warrant officer, and eight enlisted men are adequate to carry the administrative burden added by the establishment of the command, as it should be policy to decentralize as much of the administrative work as possible to the engineer groups where ample facilities are now provided.

b. Communications. The present corps engineer section has no communications personnel. The corps signal officer is responsible for communications from corps to the next subordinate commands. At present the next subordinate commands are the groups. With its establishment the Engineer Command becomes the next subordinate headquarters and the corps engineer must therefore assume responsibility for the communications between it and the groups. The communications unit, one officer and 16 enlisted men, is provided for this purpose.

c. Headquarters Company. This unit of one officer and 29 enlisted men is required to provide the normal unit administrative facilities of mess, supply and transportation.

5. Air. An air reconnaissance and liaison section of three officers and three enlisted men has also been added.

6. Recommendations. It is recommended that a headquarters and headquarters company based on the charts in inclosures 1 and 2 be authorized for the Engineer Command, Corps. No medical, dental or chaplain personnel is included, as it is contemplated that the facilities of the corps headquarters for these services will be used.

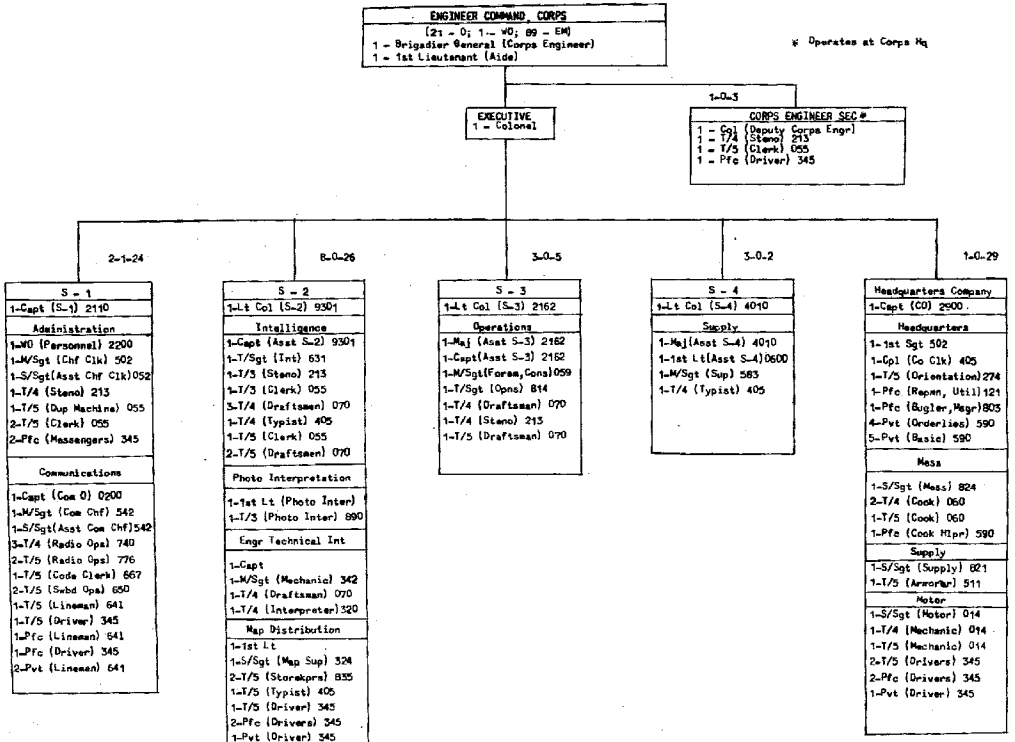

ENGINEER COMMAND, CORPS
(21 - O; 1 - WO; 89 - EM)
1 - Brigadier General (Corps Engineer)
1 - 1st Lieutenant (Aide)
* Operates at Corps Hq
EXECUTIVE
1 - Colonel
1-0-3
CORPS ENGINEER SEC *
1 - Gpl (Deputy Corps Engr)
1 - T/4 (Steno) 213
1 - T/5 (Clerk) 055
1 - Pfc (Driver) 345
2-1-24
S - 1
1-Capt (S-1) 2110
Administration
1-WO (Personnel) 2200
1-M/Sgt (Chf Clk) 502
1-S/Sgt(Asst Chf Clk)052
1-T/4 (Steno) 213
1-T/5 (Dup Machine) 055
2-T/5 (Clerk) 055
2-Pfc (Messengers) 345
Communications
1-Capt (Com O) 0200
1-M/Sgt (Com Chf) 542
1-S/Sgt(Asst Com Chf)542
3-T/4 (Radio Opa) 740
2-T/5 (Radio Ops) 776
1-T/5 (Code Clerk) 667
2-T/5 (Swbd Opa) 650
1-T/5 (Lineman) 641
1-T/5 (Driver) 345
1-Pfc (Lineman) 641
1-Pfc (Driver) 345
2-Pvt (Lineman) 641
8-0-26
S - 2
1-Lt Col (S-2) 9301
Intelligence
1-Capt (Asst S-2) 9301
1-T/Sgt (Int) 631
1-T/3 (Steno) 213
1-T/3 (Clerk) 055
3-T/4 (Draftsmen) 070
1-T/4 (Typist) 405
1-T/5 (Clerk) 055
2-T/5 (Draftsmen) 070
Photo Interpretation
1-1st Lt (Photo Inter)
1-T/3 (Photo Inter) 890
Engr Technical Int
1-Capt
1-M/Sgt (Mechanic) 342
1-T/4 (Draftsman) 070
1-T/4 (Interpreter)320
Map Distribution
1-1st Lt
1-S/Sgt (Map Sup) 324
2-T/5 (Storekprs) 835
1-T/5 (Typist) 405
1-T/5 (Driver) 345
2-Pfc (Drivers) 345
1-Pvt (Driver) 345
1-Pvt (Storekpr) 835
Air
1-Maj (Engr Air O)1981
1-Capt (Ln Pilot) 1981
1-1st Lt(Ln Pilot)1981
1-T/Sgt(Air Mechanic)747
1-T/3 (Air Mechanic)747
1-T/5 (Air Mechanic)747
3-0-5
S - 3
1-Lt Col (S-3) 2162
Operations
1-Maj (Asst S-3) 2162
1-Capt(Asst S-3) 2162
1-M/Sgt(Foreman,Cons)059
1-T/Sgt (Opns) 814
1-T/4 (Draftsman) 070
1-T/4 (Steno) 213
1-T/5 (Draftsman) 070
3-0-2
S - 4
1-Lt Col (S-4) 4010
Supply
1-Maj(Asst S-4) 4010
1-1st Lt(Asst S-4)0600
1-M/Sgt (Sup) 583
1-T/4 (Typist) 405
1-0-29
Headquarters Company
1-Capt (CO) 2900
Headquarters
1-1st Sgt 502
1-Cpl (Co Clk) 405
1-T/5 (Orientation)274
1-Pfc (Repmn, Util)121
1-Pfc (Bugler,Msgr)803
4-Pvt (Orderlies) 590
5-Pvt (Basic) 590
Mess
1-S/Sgt (Mess) 824
2-T/4 (Cook) 060
1-T/5 (Cook) 060
1-Pfc (Cook Hlpr) 590
Supply
1-S/Sgt (Supply) 821
1-T/5 (Armorer) 511
Motor
1-S/Sgt (Motor) 014
1-T/4 (Mechanic) 014
1-T/5 (Mechanic) 014
2-T/5 (Drivers) 345
2-Pfc (Drivers) 345
1-Pvt (Driver) 345

TABLE OF ORGANIZATION, HEADQUARTERS AND HEADQUARTERS COMPANY, ENGINEER COMMAND, CORPS

	HEADQUARTERS														Headquarters Company	Total Hq and Hq Company
			S - 1			S - 2										
	Command	Corps Engr Section	Administration	Communications	Total S-1	Intelligence	Photo Interpretation	Engr Technical Int	Map Distribution	Air	Total S-2	S-3	S-4	Total Headquarters		
Brigadier General	1													1		1
Colonel	1	1												2		2
Lt Colonel						(1)					1	1	1	3		3
Major										(1)	1	1	1	3		3
Captain			(1)	(1)	2	(1)		(1)		(1)	3	1		6	1	7
1st Lieutenant	1						(1)		(1)	(1)	3		1	5		5
Total Officers	3	1	(1)	(1)	2	(2)	(1)	(1)	(1)	(3)	8	3	3	20	1	21
Warrant Officer			(1)		1									1		1
M/Sgt			(1)	(1)	2			(1)			1	1	1	5		5
1st Sgt															1	1
T/Sgt						(1)				(1)	2	1		3		3
S/Sgt			(1)	(1)	2				(1)		1			3	2	5
Sgt															1	1
Cpl															1	1
T/3						(2)	(1)			(1)	4			4		4
T/4		1	(1)	(3)	4	(4)		(2)			6	2	1	14	3	17
T/5		1	(3)	(7)	10	(3)			(4)	(1)	8	1		20	6	26
Pfc		1	(2)	(2)	4				(2)		2			7	5	12
Pvt				(2)	2				(2)		2			4	10	14
Total EM		3	(8)	(16)	24	(10)	(1)	(3)	(9)	(3)	26	5	2	60	29	89
Total Personnel	3	4	(10)	(17)	27	(12)	(2)	(4)	(10)	(6)	34	8	5	81	30	111

Inclosure 2

APPENDIX 4

Chapter 4

ENGINEER COMBAT EQUIPMENT COMPANY

1. Light Equipment Company. During operations in the European Theater, the troop bases included one engineer light equipment company per corps. Since the one unit had to support two corps combat groups, it habitually operated on a divided basis, the company less a platoon operating with one group and the remaining platoon with the other. The company is not organized to operate on this basis particularly with respect to the mess personnel and to the maintenance section which is not readily divided. The additional administrative disadvantages that accrue when a platoon habitually operates away from its parent organization are obvious.

2. Dump Trucks. Throughout the World War II campaigns in Europe, there was a serious shortage of dump trucks for all engineer operations.[5] In those instances where dump trucks were available to corps, the company operated on a split basis similar to the above. The disadvantages were parallel to those already outlined.

3. Allocation at Army Level. Light equipment companies were allocated to engineer combat groups in each field army on the basis of one light equipment company per two groups. Experience indicates that at the army level each group required the support of an entire company. In addition each army group could consistently have used a dump truck company in its normal operations.

4. Merging of Units. Inasmuch as the bulk of the equipment carried by the light equipment company is earth moving equipment, as are dump trucks, the merging of the present light equipment and dump truck companies is logical.

5. Recommendations. It is recommended that:

a. An engineer combat equipment company based on the proposed table of organization shown in inclosure 1 be authorized.

b. The engineer combat equipment company be normally allotted on the basis of one per corps combat regiment and two per army combat regiment.

ENGINEER COMBAT EQUIPMENT COMPANY

1	Unit	Specification Serial Number	Technician Grade	COMPANY HEADQUARTERS		EQUIPMENT PLATOON (T/O & E 5-367)			DUMP TRUCK PLATOON (T/O & E 5-88)			Total Company
				Hq Section	Repair & Maint Section	Plat Hq	Operations Section	Total Platoon	Plat Hq	2 Sects (ea)	Total Platoon	
2	Captain			1								1
3	Co Commander	4880		(1)								(1)
4	1st Lieutenant					1		1	1		1	2
5	Plat Commander	4880				(1)		(1)	(1)		(1)	(2)
6	2d Lieutenant			1								1
7	Administrative Officer			(1)								(1)
8	Total Commissioned			2		1		1	1		1	4
9	Master Sergeant					1		1				1
10	Equip Supervisor	359				(1)		(1)				(1)
11	1st Sergeant	585		1								1
12	Technical Sergeant				2							2
13	Master Mechanic	342			(1)							(1)
14	Clerk-Auto parts	348			(1)							(1)
15	Staff Sergeant			2					1		1	3
16	Mess	824		(1)								(1)
17	Supply	821		(1)								(1)
18	Platoon	668							(1)		(1)	(1)
19	Sergeant				2					1	2	4
20	Motor	813			(1)					(1)	(2)	(3)
21	Mechanic	319			(1)							(1)
22	Corporal			2						2	4	6
23	Clerk	405		(1)								(1)
24	Dispatcher	931		(1)								(1)
25	Squad Leader	813								(2)	(4)	(4)
26	Technician, grade 4)											
27	Technician, grade 5)											
28	Private, 1 cl)			14	9		37	37	1	19	39	99
29	Private											
30	Armorer	511		(1)								(1)
31	Blacksmith	024	5		(1)							(1)
32	Bugler-Messenger	803		(1)								(1)
33	Clerk, General	055	5	(1)								(1)
34	Cook	060	4	(1)								(1)
35	Cook	060	5	(1)								(1)
36	Cook's Helper	590		(2)								(2)
37	Driver, Truck, Light	345	5)									(21)
38	Driver, Truck, Light	345	)	(1)			(8)	(8)		(16)	(32)	(20)
39	Lineman, Field	641		(1)								(1)
40	Machinist	114	5		(1)							(1)
41	Mechanic, Auto	014	4)		(1)							(2)
42	Mechanic, Auto	014	5)		(1)				(1)	(1)	(3)	(3)

	1	2	3	4	5	6	7	8	9	10	11	12
	Unit	Specification Serial Number	Technician Grade	COMPANY HEAD-QUARTERS		EQUIPMENT PLATOON (T/O & E 5-367)			DUMP TRUCK PLATOON (T/O & E 5-88)			Total Company
				Hq Section	Repair & Maint Section	Plat Hq	Operations Section	Total Platoon	Plat Hq	2 Sects (ea)	Total Platoon	
43	Mechanic, Diesel	013	4	--	(1)							(1)
44	Mechanic, Tractor	319	4		(1)							(1)
45	Mechanic, Tractor	319	5		(1)							(1)
46	Operator, Switchboard	650		(1)								(1)
47	Operator, Radio, High Speed	766	4	(1)								(1)
48	Operator, Radio, High Speed	766	5	(1)								(1)
49	Welder	256	4		(1)							(1)
50	Welder, Combination	256	5		(1)							(1)
51	Driver, Truck, Heavy	931	5				(6)	(6)				(6)
52	Operator, Air	081	5				(3)	(3)				(3)
53	Compressor											
54	Operator, Bulldozer	359	5				(7)	(7)				(7)
55	Tractor											
56	Operator, Crane	064	4				(6)	(6)				(6)
57	Shovel											
58	Operator, Earth Auger	359	5				(1)	(1)				(1)
59	Operator, Road Grader	359	4				(3)	(3)				(3)
60	Operator, Road Grader	359	5				(3)	(3)				(3)
61	Basic	729		(2)						(2)	(4)	(6)
62	Total Enlisted			19	13	1	37	38	2	22	46	116
63	Aggregate			21	13	2	37	39	3	22	47	120
64	O Trailer, 1-ton			1	1							2
65	O Truck, ¼-ton			1		1		1	1		1	3
66	O Truck, 3/4-ton, WC			1	1							2
67	O Truck, 2½-ton, cargo			1			1	1				2
68	O Truck, 2½-ton, dump						4	4				4
69	O Truck, 2½-ton, dump, w/winch									12	24	24
70	O Semi-trailer, front loading, 20-ton						5	5				5
71	O Trailer, full low bed, 8-ton						1	1				1
72	O Truck, 4-ton, cargo						1	1				1
73	O Truck, 6-ton, prime mover						5	5				5

APPENDIX 5

Chapter 4

ENGINEER PANEL BRIDGE TRANSPORT COMPANY

1. Light Equipage. When the light ponton company was reorganized to provide the new panel bridge transport company, the equipage platoon was eliminated.[6] This was a decided mistake. The equipment of this platoon included 72 assault boats and 432 feet of infantry foot bridge plus the transportation to move them. Since most of the division engineer combat battalions placed their limited number of assault boats in depot storage and since the foot bridge was not organic equipment in the battalions, the equipage platoon provided the only readily available source for these items. Corps engineers strongly recommend that the light equipage platoon be returned to the panel bridge transport company.[3]

2. Transportation. The engineer panel bridge transport company has a total of 48 trucks, 2½-ton cargo.[6] These should be dump trucks for two principle reasons: first, dump trucks facilitate the unloading of panel bridging, and second, the company would be, in effect, a standby dump truck company. The need for such a reserve arises frequently. An example was the period of spring thaw in the European Theater in early February 1945, when the demands for bridging were at a minimum and the total number of available dump trucks was entirely inadequate to meet the demands for hauling road metal. The provision of dump trucks in this unit and the incorporation of dump trucks into the combat equipment company (see Appendix 4) eliminate the dump truck company as a type of unit essential to a field army.

3. Recommendations. It is recommended that:

a. The equipage platoon be restored to the panel bridge transport (old light ponton) company.

b. The panel bridge transport company be equipped with dump trucks in lieu of cargo trucks.

APPENDIX 6

Chapter 4

ENGINEER TOPOGRAPHIC UNITS

1. Discussion. The organization of topographic units in both corps and army has been carefully considered.[7,8,9,10,11,12] However, neither sufficient factual data nor the necessary experienced personnel for interview have been available to enable the Engineer Section of the General Board to make adequate detailed recommendations regarding the organization of corps and army topographic units. On the other hand, limited factual data available plus personal knowledge and experience of members of the Engineer Section of the Board, as well as of the few experienced personnel interviewed, lead to certain general conclusions that follow:

a. The activities of topographic units, particularly at corps level, have not been confined to their assigned missions. A need for their new missions apparently existed.[3] Therefore, their proper missions should be redefined and the units reorganized to accomplish the revised missions.

b. Missions performed by topographic units, particularly corps units, which were beyond their prescribed mission were the reproduction of the following:

(1) Tactical documents. Field orders, artillery firing plans, intelligence reports, studies and posters and special tactical studies.

(2) Historical data. After-action reports, unit histories, historical pictures.

(3) Morale services. Certificates for decorations, citations and awards, special service and church announcements, greeting cards, special messages, unit papers, menus, etc.

c. The work of survey units was almost entirely confined to support of field artillery.

d. There was an excess of reproduction capacity in corps and a deficiency in army.

e. Sufficient qualified personnel were not available at either corps or army headquarters to supervise the topographic mission.

f. Coordination of the mapping and map distribution policies of the commanding general should be a G-3 function.

2. Recommendations. It is recommended that:

a. The missions of corps and army topographical units be reviewed and redefined by the Chief of Engineers.

b. The organization of corps and army topographical units be readjusted in accordance with the redefined missions.

c. The conclusions cited above be considered in the review and redefinition of the missions and in the reorganization of the units.

APPENDIX 7

Chapter 4

HEADQUARTERS, ENGINEER COMMAND, ARMY

1. Army Engineer Requirements. When the study of the engineer organization within a field army was initiated, it was considered necessary for each engineer echelon to have its own headquarters and headquarters company to insure adequate organization. This is justified where the echelon is predominantly a tactical unit. Engineer echelons blend from the essentially complete combat echelon at division level through corps and army to the complete service echelon at the communications zone level. Within divisions and corps the combat functions of engineers predominate; at army level the service functions gain ascendency. Under the former situation where the corps headquarters must be more sensitive to changes in the tactical situation, a separate headquarters and headquarters company is justified. At army level where time, though important, is not so critical, the command headquarters is necessary, but it can function adequately as part of the army headquarters, using the facilities of the army headquarters company. Therefore, a separate headquarters company has not been recommended for army.

2. Present Engineer Section. The present army engineer section proved to be adequate to carry out the functions of the army engineer, except for the control of topographic and technical intelligence activities,[13] and can absorb the additional administration duties outlined for the engineer command in chapter 2. For the topographic and intelligence missions, cellular units (survey liaison detachments and technical intelligence teams, research) were authorized by the War Department for each army. These were located at, and operated out of, the army engineer section.

3. Cellular Units. These cellular units should be integrated into the headquarters, engineer command, army. They would provide, with the presently authorized section, a headquarters adequate to control properly the army engineer organization.

4. Previous Authorization. T/O 5-200-1 authorized an Engineer Headquarters, Army. It was rescinded 26 October 1944.

5. Recommendations. It is recommended that T/O 5-200-1 be reinstituted in accordance with the charts shown in inclosures 1 and 2.

HEADQUARTERS ENGINEER COMMAND, ARMY
(O - 36, WO - 2, EM - 58)

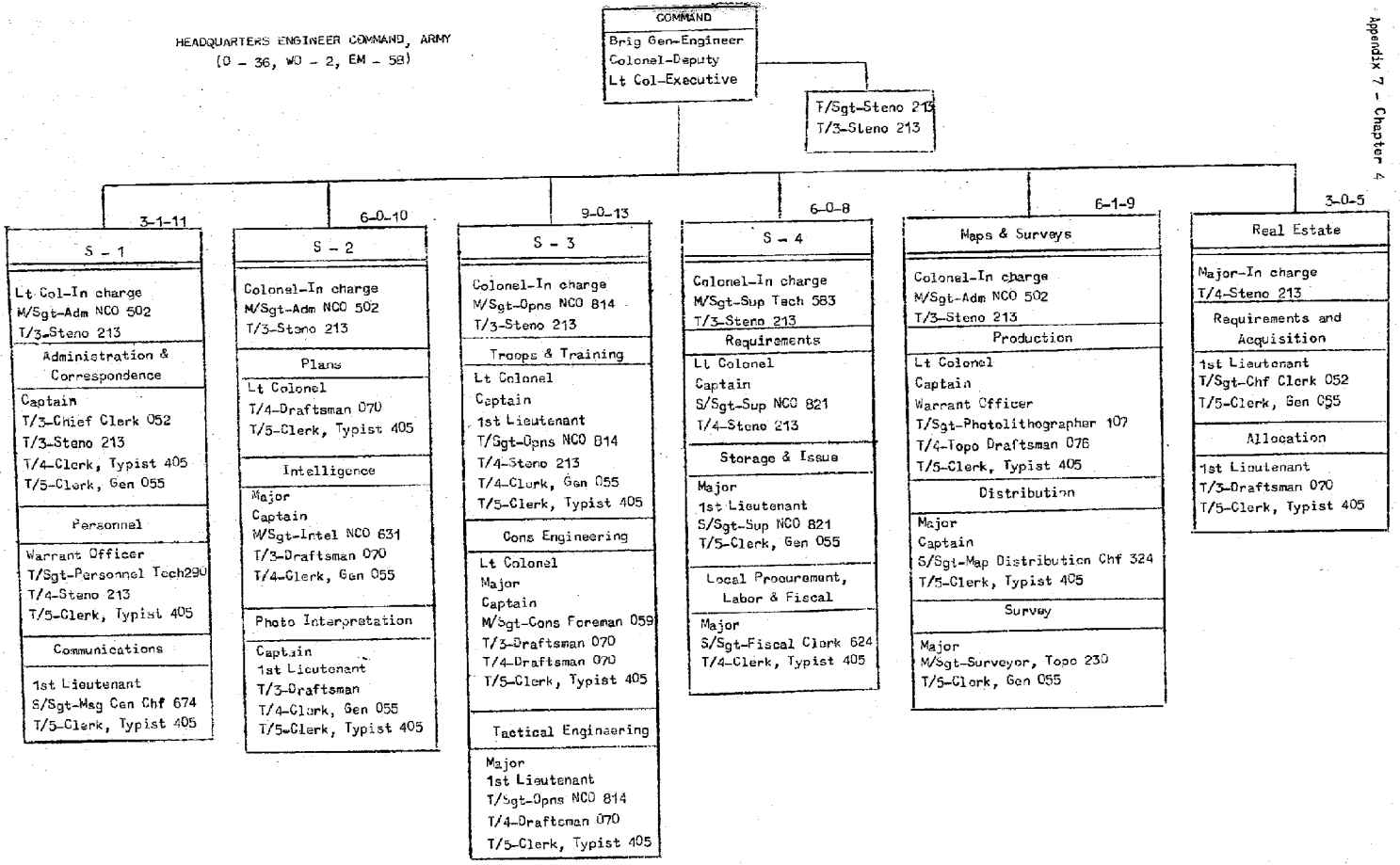


TABLE OF ORGANIZATION, HEADQUARTERS, ENGINEER COMMAND, ARMY

	HEADQUARTERS																												
		S - 1					S - 2					S - 3					S - 4					MAPS					REAL ESTATE				
	COMMAND	O. I. C.	ADMINISTRATION	PERSONNEL	COMMUNICATIONS	TOTAL S-1	O. I. C.	PLANS	INTELLIGENCE	PHOTO INT.	TOTAL S-2	O. I. C.	TRAINING	CONS. ENGR.	TACTICAL ENGR.	TOTAL S-3	O. I. C.	REQUIREMENTS	STORAGE	PROCUREMENT	TOTAL S-4	O. I. C.	PRODUCTION	DISTRIBUTION	SURVEY	TOTAL MAPS	O. I. C.	REQ. & ACQ.	ALLOCATION	TOTAL REAL ESTATE	TOTAL HEADQUARTERS
Brigadier General	1																													1
Colonel	1						(1)				1	(1)				1	(1)				1	(1)				1				5
Lt Colonel	1	(1)				1		(1)			1		(1)	(1)		2		(1)			1		(1)			1				7
Major									(1)		1			(1)	(1)	2			(1)	(1)	2			(1)	(1)	2	(1)			1	8
Captain			(1)			1			(1)	(1)	2		(1)	(1)		2		(1)			1		(1)	(1)		2					8
1st Lieutenant					(1)	1				(1)	1		(1)		(1)	2			(1)		1							(1)	(1)	2	7
2d Lieutenant																															
TOTAL OFFICERS	3	(1)	(1)		(1)	3	(1)	(1)	(2)	(2)	6	(1)	(3)	(3)	(2)	9	(1)	(2)	(2)	(1)	6	(1)	(2)	(2)	(1)	6	(1)	(1)	(1)	3	36
WARRANT OFFICERS				(1)		1																	(1)			1					2
M/Sgt		(1)				1	(1)		(1)		2	(1)		(1)		2	(1)				1	(1)				1					7
1st Sgt																															
T/Sgt	1			(1)		1							(1)		(1)	2							(1)			1		(1)		1	6
S/Sgt					(1)	1												(1)	(1)	(1)	3			(1)	(1)	2					6
Sgt																															
Cpl																															
T/3	1	(1)	(2)			3	(1)		(1)	(1)	3	(1)		(1)		2	(1)				1	(1)				1			(1)	1	12
T/4			(1)	(1)		2		(1)	(1)	(1)	3		(2)	(1)	(1)	4		(1)		(1)	2		(1)			1	(1)			1	13
T/5			(1)	(1)	(1)	3		(1)		(1)	2		(1)	(1)	(1)	3			(1)		1		(1)	(1)	(1)	3		(1)	(1)	2	14
Pfc																															
Pvt																															
TOTAL ENLISTED MEN	2	(2)	(4)	(3)	(2)	11	(2)	(2)	(3)	(3)	10	(2)	(4)	(4)	(3)	13	(2)	(2)	(2)	(2)	8	(2)	(3)	(2)	(2)	9	(1)	(2)	(2)	5	58

APPENDIX 8

Chapter 4

ENGINEER SUPPLY GROUP

1. Experience During Operations. Present doctrine intends that the engineer section, army headquarters, provide the necessary supervision and coordination of all engineer units engaged in engineer supply and service within the army area. Initially all armies tried to perform this mission as regulations intended, but it was soon found impossible to do an adequate job. As soon as the troop basis permitted, the First, Third, Seventh and Ninth Armies employed an engineer combat group headquarters and headquarters company for this purpose.[8,14,15] Fifteenth Army did not become sufficiently involved to make this step necessary.[9] The operating armies are unanimous in their recommendations that a group headquarters be included in the engineer troop basis of an army with the sole mission of administering and coordinating engineer supply and service units.[8,15]

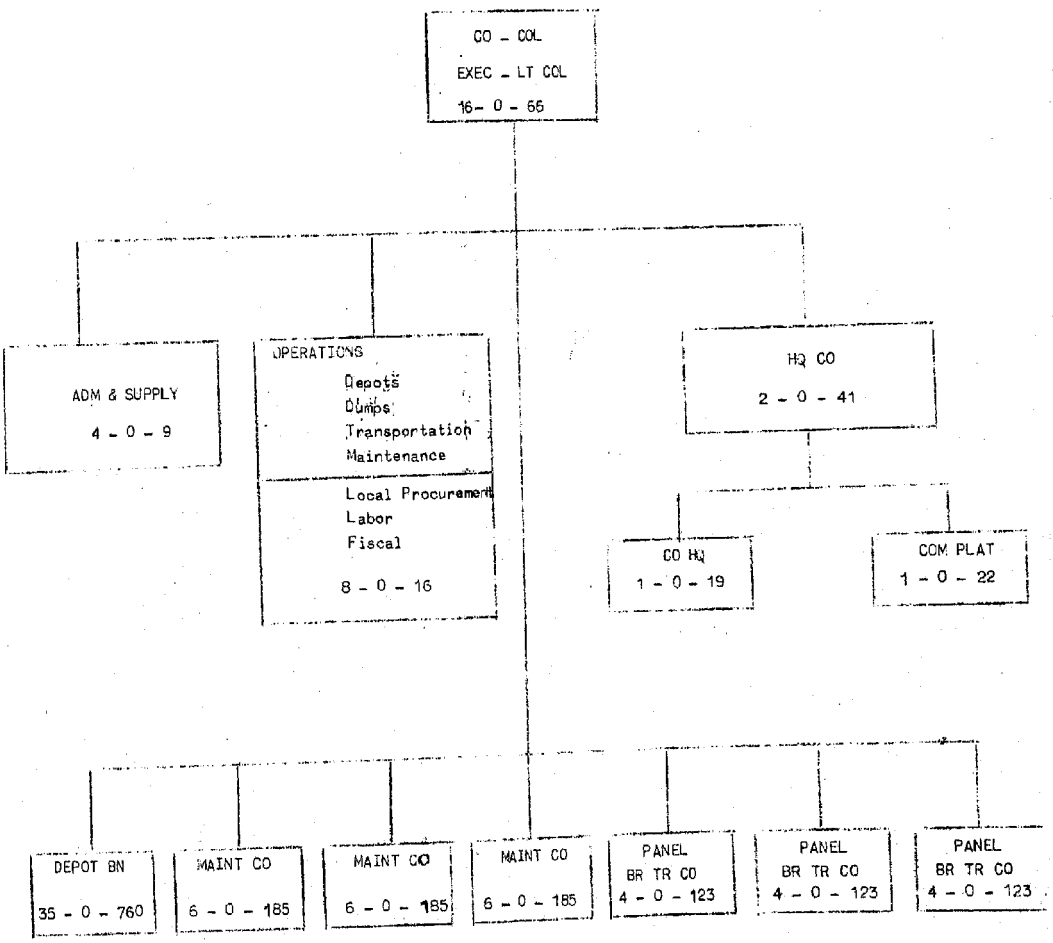
2. Supply Group. The engineer combat group headquarters supplied an organization of approximately the proper size to effect the coordination of the supply activities, but its organization and the qualifications of its personnel were not adequate.[15] The supply group should become a permanent part of the army troop basis. Its organization and the qualifications of its specialist personnel should be appropriate to its assigned role.

3. Units Under Supply Group. All service and supply units should be assigned or attached to the group headquarters. Because their activities are governed so closely by army operations and troop dispositions, the map distribution company, the water supply company, the fire fighting platoons, the topographic battalion and the camouflage battalion can best be operationally controlled by the engineer command at army headquarters. These units should be attached to the supply group for administration only. The balance of the units should be assigned to the supply group.

4. Requirements. The engineer supply group headquarters must furnish administrative and supply service to all of its subordinate units attached or assigned. It must include specialist personnel to supervise the operation of depots and dumps, coordinate the employment of transportation and maintenance units, provide the personnel for procurement of local labor and materiel from both military and local resources and include adequate personnel to maintain the necessary supply and fiscal records. This organization will of necessity include a headquarters company consisting of a headquarters platoon and a communications platoon.

5. Recommendations. It is recommended that an Engineer Supply Group be authorized and organized as indicated on the chart shown in inclosure 1.

ENGINEER SUPPLY GROUP
(O - 16, WO - 0, EM - 66)



APPENDIX 9

Chapter 4

ENGINEER DEPOT BATTALION

1. Experience During Operations. Engineer depot operations in the European Theater were continually hampered by lack of the following: sufficient supervisory personnel; sufficient organic equipment and personnel for loading supplies and internal operation of installations; personnel to supervise either civilian or prisoner of war labor; sufficient organic personnel to provide security; and, truck transportation.[13,16]

2. Shortages. The shortages in depot personnel existed throughout the operations and were alleviated in part shortly prior to V-E Day by the assignment of additional platoons to all operating armies. These augmentations were not uniform; some armies received a depot company less a depot platoon while other armies received only additional depot platoons. This augmenting personnel was only sufficient for depot and dump operations from an administrative angle and did not alleviate the other shortages.

3. Cranes. The lack of sufficient cranes for the unloading and loading of heavy items of equipment was met by items in Class IV stocks, but this source could not be depended upon and did not alleviate the situation as far as the shortage of crane operators was concerned.

4. Labor. Labor supervisory companies (two officers and seven men) organized just prior to the cessation of hostilities provided the first source of personnel for the supervision of labor. Previously this requirement had been met by depot company personnel already critically short.

5. Security. No provision was made in the depot company for local security of the depot. Close guard was absolutely essential to protect the valuable items of equipment and particularly explosives. This protection was generally provided by personnel from a combat battalion which furnished both guard and labor. At the army dumps established in the corps zones the corps engineer was called upon to furnish corps engineer personnel to meet operational and guard requirements.

6. Transportation. The movement of engineer supplies, engineer depots and engineer dumps was accomplished by quartermaster truck companies, engineer light ponton companies, engineer heavy ponton battalions and engineer treadway bridge companies.

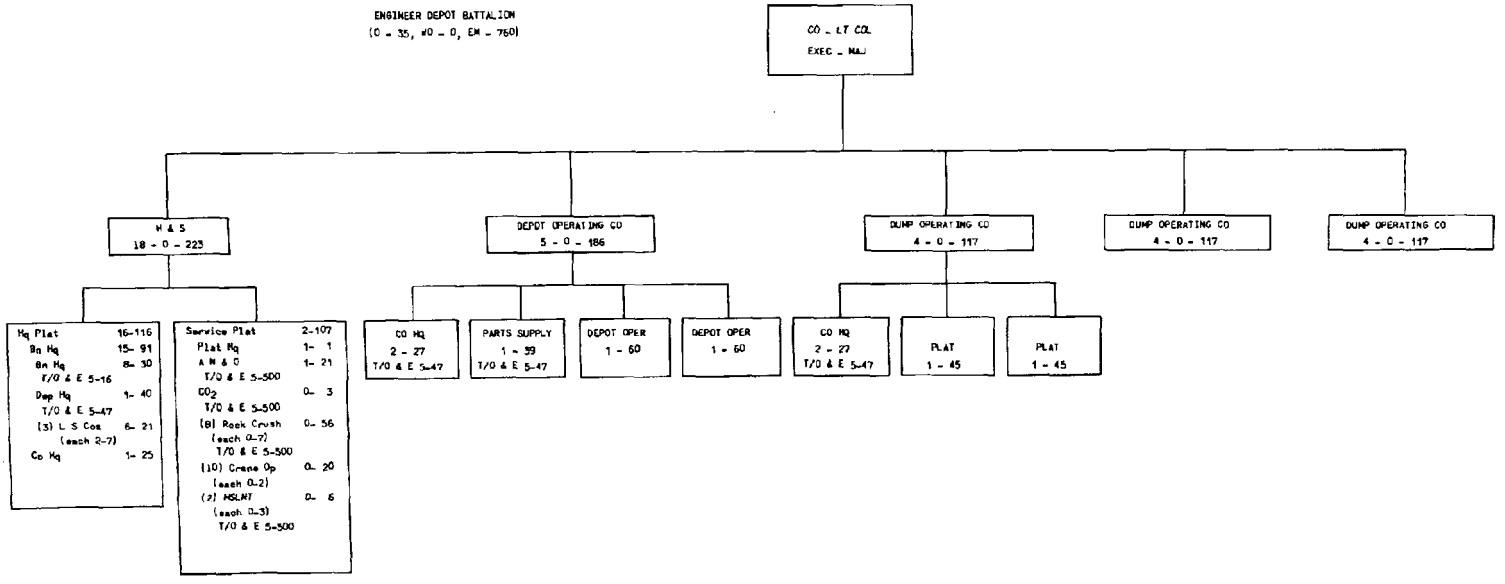
7. Requirements. The engineer depot organization should include organically sufficient personnel and equipment to operate the army depot plus an advance dump in each corps area, supervise civilian and prisoner of war labor employed in these installations and provide its own local security. This organization should include those cellular units whose function is closely connected with the production of engineer items of supply and engineer depot operations.

8. Advantages. An army organization should be provided to perform the above missions. They could then be accomplished with less personnel than is actually used at present and without draining combat and other units of personnel necessary to them for the accomplishment

of their own missions. Such an organization will be of battalion size.

9. Recommendations. It is recommended that an engineer depot battalion, organized in accordance with the chart shown in inclosure 1 be substituted for the present engineer depot company and assigned on a basis of one per army.

ENGINEER DEPOT BATTALION
(O - 35, WO - 0, EM - 760)



APPENDIX 10

Chapter 4

ENGINEER MAP DEPOT AND DISTRIBUTION COMPANY, ARMY

1. Present Deficiency. The present engineer troop basis for an army does not include an organization capable of handling map storage and distribution.

2. Experience of Armies. Each of the operating armies under 12 US Army Group borrowed sufficient personnel and transportation and established provisional organizations to handle these functions. The First US Army initially employed the survey platoon and the map distribution section of the topographic battalion. When survey requirements precluded the continued use of this provisional organization, a portion of an engineer combat company assumed the duties of the operation of the map depot and delivery of maps.[17] The Third US Army augmented the map storage and distribution section of the topographic battalion by enlisted men drawn from the survey platoon.[17] Ninth US Army, prior to the arrival of the topographic battalion assigned to it, used a map depot detachment on loan from the communications zone to operate its army map depot. Upon the arrival of the topographic battalion, its map storage and distribution section was augmented by men from the survey platoon and assumed the operation of the army map depot. This personnel was further augmented during depot movements and heavy distribution periods.[17] Seventh US Army was authorized by Mediterranean Theater of Operations to form an engineer map depot company, and this organization was continued under 6 Army Group. It provided personnel for operation of both the army and corps map depots and sufficient personnel to make delivery of maps to divisions.[17]

3. Results. Although organizations and methods of operations differed, the results achieved were generally satisfactory.[12,17]

4. Delivery of Maps. First US Army made all deliveries direct to divisions. The Third and Ninth Armies delivered to corps only.[17] Seventh US Army Engineer, upon the recommendation of the corps engineers, did not deliver maps below corps headquarters.[17]

5. Distribution of Maps. The distribution of maps presents a peculiar and fairly complex supply problem of considerable magnitude, particularly since it is so sensitive to changes in tactical operations.

6. Separate Functions. There is no close connection between the production and distribution of maps. Printing agencies most often are engaged in printing maps for future operations, while current deliveries are made from existing stocks.[17] At the army level the coordinating agency is the map sub-section of the engineer section. To make the organization charged with the procuring, stocking, and delivery of maps an organic part of the topographic battalion would only serve to divide the mission of the latter unit.

7. Policy. Army should deliver maps only as far as corps headquarters and not to divisions. The study of the engineer command, corps, (Appendix 3) establishes the corps map depot in the headquarters of the engineer command, corps, to handle map distribution within the corps.

8. Requirements. The agency for the stocking and delivery of maps at army headquarters must include sufficient personnel and transportation to operate and move the army map depot and to break down and deliver maps to all corps and to subordinate army units.

9. Recommendations. It is recommended that an engineer map depot and distribution company, army, organized in accordance with the T/O shown in inclosure 1 be authorized and assigned on the basis of one per army.[18]

ENGINEER MAP DEPOT AND DISTRIBUTION COMPANY, ARMY

1	2	3	4	5	6	7	8	9	10
1 Unit	Spec. Serial No.	Technician Grade	Hq Platoon	Base Depot Platoon	Map Distribution Platoon: Map Distribution Section	Map Distribution Platoon: Aggregate 3 Distribution Sections	Total Company	Enlisted Cadre	Remarks
2 Captain	(7915)			1			1		
3 1st Lieutenant	(7915)			1		1	2		
4 2d Lieutenant	(4113)		1				1		
5 Total Commissioned			1	2		1	4		
6 First Sergeant	(585)		1				1	1	
7 Technical Sgt., incl.				1			1	1	
8 Chief, map distr.	(252)			(1)			(1)	(1)	The engineer map depot company army is normally assigned one per army. The primary mission is to operate the army map depot, provide map service for army, and to distribute maps to corps under the army.
9 Staff Sergeant, incl.			3		(1)	3	6	6	
10 Chief, map distr.	(252)				(1)	(3)	(3)	(3)	
11 Mess	(824)		(1)				(1)	(1)	
12 Motor	(813)		(1)				(1)	(1)	
13 Supply	(821)		(1)				(1)	(1)	
14 Sergeant, incl.					(1)	3	4	1	
15 Chief Clerk	(835)			(1)	(1)	(3)	(4)	(1)	
16 Corporal, incl.			1				1	1	
17 Company clerk	(405)		(1)				(1)	(1)	
18 Technician, grade 3)				1			1	1	
19 Technician, grade 4)			2	5			7	2	
20 Technician, grade 5)			7	9	(5)	15	31	1	
21 Privats, 1 cl)			4	6	(4)	12	22		
22 Privats			4	7	(2)	6	17		
23 Checker	(835)	4		(1)			(1)		
24 Checker	(835)	5		(1)			(1)		
25 Checker	(835)			(2)			(2)		
26 Clerk, shipping	(835)	5		(1)			(1)		
27 Clerk, stock record	(323)	5		(1)			(1)		
28 Clerk, typist	(405)	5		(1)			(1)		
29 Cook	(060)	4	(1)				(1)	(1)	
30 Cook	(060)	5	(2)				(2)	(1)	
31 Cook's helper	(521)		(1)				(1)		
32 Map stor & distr	(186)	4		(4)			(4)		
33 Map order assemblage & distr	(186)	5		(5)	(3)	(9)	(14)		
34 Map order assemblage & distr	(186)			(8)	(3)	(9)	(17)		
35 Mechanic Auto	(014)	4	(1)				(1)	(1)	
36 Mechanic Auto	(014)	5	(1)		(1)	(3)	(4)		
37 Truck Driver, heavy	(245)	5	(3)				(3)		
38 Truck Driver, heavy	(245)		(5)				(5)		
39 Truck Driver, light	(345)	5	(1)		(1)	(3)	(4)		
40 Truck Driver, light	(345)		(2)		(2)	(6)	(8)		
41 Warehouseman, Chief	(251)	3		(1)			(1)	(1)	
42 Basic	(521)			(3)	(1)	(3)	(6)		
43 Total Enlisted Men			22	30	(13)	39	91	14	
44 Aggregate Co			23	32	(13)	40	95	14	
45 O Carbine, cal. .30			22	30	(13)	39	91		
46 O Pistol, auto., cal. .45			1	2		1	4		
47 O Trailer, 1-ton			7				7		
48 O Truck, 1/4-ton			1		(1)	3	4		
49 O Trailer, 1/4-ton			1		(1)	3	4		
50 O Truck, 3/4-ton WC			2		(2)	(6)	8		
51 O Tow Motor, 2tw/lift				1			1		
52 O Truck, 2 1/2-ton, LWB cargo			7				7		
53 O Truck, 4-ton, cargo			1				1		

CHAPTER 5

ENGINEER TROOP BASIS

SECTION 1

INTRODUCTION

29. Scope. In this chapter the engineer organization in a field army is discussed by echelon from front to rear, a table of troop allotment is developed and a comparison made between it and the European Theater of Operations, United States Army, Engineer Troop Allotment Table, as it existed at the end of hostilities in May 1945.

30. Definitions and Assumptions.

a. A unit engineer is an officer so detailed for every tactical unit the size of a division or larger. As such, he is a member of the special staff of his commander.

b. A type corps consists of three infantry and one armored divisions, and a type army consists of three corps.

c. The modified regimental type engineer organization outlined in Chapter 3 is provided for corps and armies.

d. Attachment of one unit to another entails a change in command, while support of one unit by another involves no such change.

e. Special engineer units are those whose capabilities are limited to the accomplishment of specific missions requiring specialized equipment and personnel.

f. Small, cellular units, such as special teams and detachments, should be integrated, whenever possible, into the organization with which they normally function.

31. Basic Principles. There are certain fundamental principles which either have been established as doctrine or which have been proved by experience to be warranted. These are:

a. A unit engineer should:

(1) Command all engineer troops under the direct control of his unit headquarters.

(2) Exercise both command (including administration) and staff functions.

(3) Be responsible for all engineer operations in the area of his unit.

b. Responsibility of the unit engineer is defined as follows:

(1) For all work performed in accordance with the unit mission by assigned or attached troops, complete responsibility.

(2) For work performed at the request of the unit by troops not assigned or attached, responsibility limited: for planning, to indicating the requirements of the unit; for execution, to coordinating the work with other operations in the area and checking it to insure that the requirements are met, particularly as regards time of completion; and for administration, to coordinating the administration of the units engaged with the plans and policies of the unit commander.

(3) For work performed in accordance with the plans of a higher headquarters, including construction by aviation engineers, by troops not assigned or attached, responsibility limited to coordinating the work with other operations in the area and the administration with the plans and policies of the unit commander.

c. Engineer special units should be assigned to the lowest headquarters whose combined sub-units normally require the capacity of the special unit.

d. Engineer support of the next lower echelon must be pushed forward aggressively.

SECTION 2

DIVISION ECHELON

32. Purpose. Throughout operations in the European Theater at least two engineer combat battalions were normally required to accomplish the necessary engineer work in each division area.[1] This section points out the reasons why both of these battalions should be an integral part of the division.

33. Assumptions and Basic Principles.

a. Responsibility without authority is unsound in principle and should not be allowed to exist at any echelon.

b. This study is based on the infantry and armored divisions as they are presently organized.

c. It is assumed that the airborne division will be reorganized in accordance with the recommendations of airborne division commanders in the European Theater.[1] Since they recommend that the airborne division have the same basic organization as the infantry division, the remarks on the infantry division will be considered to apply equally as well to the airborne division.

34. Background. The reorganization of the engineer component in both the infantry and armored divisions, made prior to operations on the continent, appears to have been established on the arbitrary basis of an allowable percentage of engineers to other troops in the division and not on a field-tested analysis of the engineer requirements.

35. Responsibility of Division Engineer. The division engineer is held responsible for the proper accomplishment of all engineer missions in the division area. To fulfill his responsibility he should have permanently under his command all the engineer means required for all

the normal engineer work. He should have available upon request to higher echelon the engineer support necessary to meet any special requirement.

36. Normal Requirements. The division engineer battalion was not adequate to handle all the work normally necessary in the division area. Experience in World War II indicates that the services of at least two engineer battalions were constantly required.1

37. How Requirements Were Met.

a. In the infantry division areas, both of the required engineer combat battalions were physically located in the area. One of them was the organic engineer unit, the other was a corps combat battalion which was rarely attached to the division but operated in close support of it. This was usually the leading battalion of the corps engineer group functioning directly behind the division. The close support it provided was arranged by mutual, verbal agreement between the division engineer and the corps engineer or his representative from the supporting group. Thus, personalities, and not clean-cut command established by regulations, determined the division engineer's control over the additional unit upon which he had to rely for the accomplishment of his mission.

b. The deficiency in the armored divisions, when they were employed on penetrations, was met by habitually attaching at least one corps engineer battalion to the division.1 Since the attached battalion or battalions were not equipped with vehicles with the same cross-country characteristics as those of the division, the armor was supported by a unit of limited maneuverability.

38. Effect of Organic Deficiency.

a. On successive echelons. Because of this organic deficiency in the strength of the division engineer component, engineer support furnished by higher echelons to lower echelons far exceeded anything contemplated by written doctrine. This basic deficiency of engineers within the division was reflected in turn through corps, army, and into the communications zone.1,2 Each successive echelon pushed its engineer support abnormally far forward. In turn each was forced by necessity to request the next echelon to move up to take over engineer work in its area which it otherwise would have been capable of doing.

b. On teamwork. The battalion placed in close support of divisions changed frequently so that the division engineer did not become as familiar with its capabilities and shortcomings as he could have had the unit been constant and part of his own command. Organic battalions provided better teamwork with other elements of the division than strange supporting battalions. One of the greatest assets of any team of combined arms in a joint action, such as a river crossing, is confidence in one another, a familiarity with the limitations and capabilities of one another and an intimate knowledge of the personalities of the leaders concerned. With the organic engineers in the division, this necessary teamwork, confidence and knowledge of personalities was soon developed; with the ever-changing, strange supporting engineers, it was not.

c. On planning. The responsibility for proper engineer planning rested with the division engineer. His knowledge of the strength and weaknesses of divisional units and the division method of operation placed him in the position of being the engineer who could best determine the proper allocation of the engineer support. Under the conditions that existed, because of the experience level of the division

engineer, the planning responsibility, for special operations where additional increments of engineers were required, was frequently passed to another agency, either engineer group commander or corps engineer.[1] Reestablishment of the division engineer component as a regiment would restore to the division the engineer experience it required.

39. Security. Close support battalions were not integrated into the division security plan.

40. Rotation. Engineer work was continuous and frequently reached a peak during prolonged defensive operations. An additional battalion would have afforded the division engineer more of an opportunity to rest his unit.

41. Opinions of Engineers. Division and corps engineers are practically unanimous in their opinion that an increase in the division engineer component is necessary.[1] The Engineers of the First[3], Third[3], Seventh[1], and Fifteenth Armies[4] all recommend the return to a regiment of two battalions in the division. The engineer of Ninth Army recommended no change, but qualified this by stating that the division commander would use a second battalion as additional infantry.[5]

42. Type of Unit. The engineer component of a division should be of regimental size. Within the division, engineer task assignments are normally of company, rather than battalion, size and there is not the requirement for the engineer battalion to be capable of independent operations to the same extent as battalions in the corps and army echelons. For normal operations there is no requirement within the division echelon for special engineer companies to be assigned or attached. There is a need, however, for an adequate headquarters and service company to meet the normal heavy equipment and other requirements of the organic battalions. A regimental, rather than a group-type, organization is therefore most suitable.

43. Recommendations. It is recommended that the engineer component of the infantry, armored and airborne divisions be increased to a regiment of two, dependent battalions with an adequate regimental headquarters and service company.

SECTION 3

CORPS ECHELON

44. Purpose. This section establishes the number and type of engineer units required within the corps echelon and their proper grouping.

45. Assumptions.

a. The engineer command, corps, as developed in chapter 2, will be adopted.

b. The engineer combat regiment, as developed in chapter 3, will be used. This regiment consists of a headquarters and headquarters company; three independent assigned battalions; and the necessary special companies assigned or attached.

c. Engineer special units should be assigned to the lowest headquarters whose combined sub-units normally require the capacity of the special unit.

46. Troop Basis Used. The normal allotment of engineer units to corps in the European Theater during World War II was:

Two group headquarters
Six combat battalions
Two light ponton companies
Two treadway bridge companies
One maintenance company
One topographic company
One light equipment company
One technical intelligence team
One photo interpretation team[6].

Although it was not always possible to furnish each corps all of the above units because of an overall European Theater shortage of combat engineer units during most of the war, the above units, when they were furnished according to this allotment, proved to be generally satisfactory as to number and type with the following exceptions: lack of an engineer command headquarters for overall control[7], lack of dump trucks[8], lack of general transportation, particularly for hauling Bailey bridging[9], and difficulties of administration when companies (for example, the light equipment company) operated habitually split between two groups.[8]

47. Engineer Command, Corps. To remedy the demonstrated deficiency in not having an overall command headquarters to control the engineer units within corps, the engineer command, corps, should be established.[7]

48. Regiments Required. The engineer command, corps should contain two regiments of the type outlined in chapter 3. It was common practice in the European Theater to have two groups per corps. This provided only for minimum operational necessity, with no provision for rehabilitation of men and equipment. The two regiments normally would have six battalions as a basis.[9]

49. Special Type Units Required. The engineer command, corps, should include the following types of special units:[9]

Bridge - fixed and floating.
Light Equipment.
Dump Truck.
Maintenance.
Topographic.
Technical Intelligence.
Photo Interpretation.

a. Bridge Companies. There should be two fixed and two floating bridge companies per corps.[9] The bridge companies employed in the European Theater were the light ponton (Bailey) company and the treadway bridge company. As presently reorganized, these are known as the engineer panel bridge transport company and the engineer ponton bridge company, pneumatic float. For normal operations the bridging requirements of the two regiments will be essentially the same and the combined sub-units of each regiment will require a bridge company of each type. Therefore, in accordance with the principle stated in paragraph 45c above, a bridge company of each type should be assigned to each regiment. Assignment has the added advantages of clarifying the administrative position of the special companies and developing the morale and sense of loyalty between them and the regiment to a much higher degree than if they were merely attached.[10] Deficiencies in type of transportation and equipage in the new engineer panel bridge transport company should be corrected.[11]

b. Light Equipment and Dump Truck Companies. The equivalent of half a light equipment company was habitually attached to each corps group.[9] A shortage of dump truck companies existed in the European Theater continuously until the end of hostilities.[8] Each corps group continually required the services of half a dump truck company.[9] Light equipment companies and dump truck companies, when the latter were available, habitually operated with a platoon attached to one group, and the company less a platoon attached to the second group.[9] This split basis of operation made administration exceedingly difficult. A modified organization consisting essentially of a headquarters and maintenance section, plus an equipment platoon of the present light equipment company and a dump truck platoon of the present dump truck company would eliminate the necessity for these two types of units to operate on a split basis. Such an engineer combat equipment company should be organized.[12] Combat experience has demonstrated that the sub-units of a group normally required the equipment, including dump trucks, that would be in one such company[9]; therefore, a combat equipment company should be assigned to each regiment.

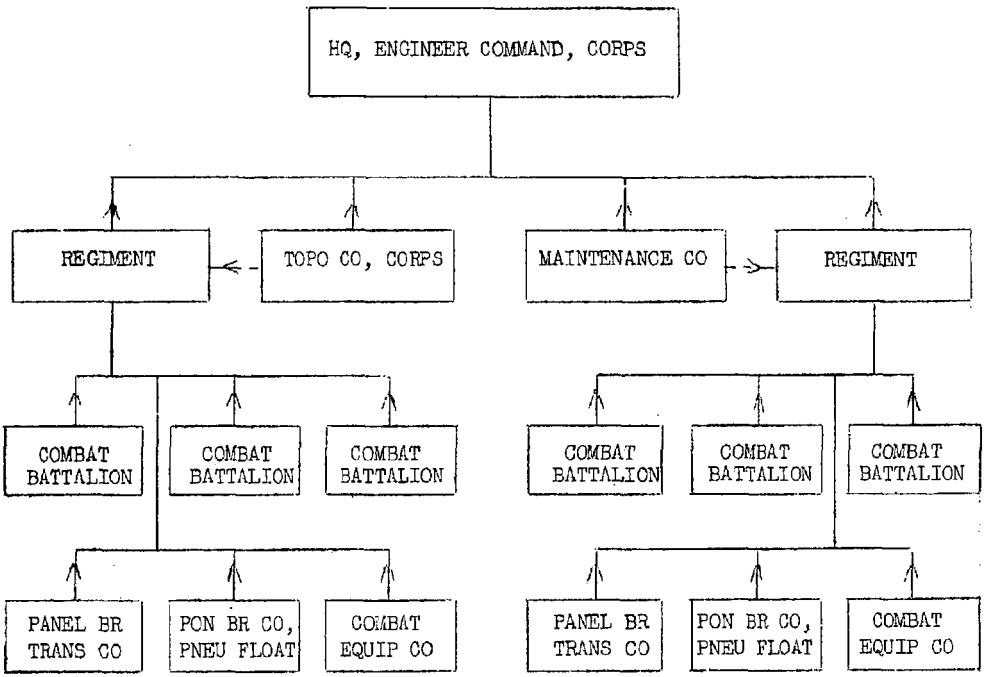
c. Maintenance Company. The maintenance company serves the entire corps, but its work is at group level and below. There is argument for replacing the company by smaller maintenance sections organic with regiments. Experience has proven that more efficient maintenance results from a central location, quite well to the rear, with contact teams visiting forward units.[9] This permits better shop location and better working conditions. The organization of the company is such that it is not effectively broken down into two smaller units. The organization of the company should be retained as it is, and one company should be assigned to the engineer command, corps.[9]

d. Topographic Unit. A topographic unit is required in the corps echelon[9], but whether or not this unit should be essentially the same as the present topographic company, corps, is open to question.[13] Regardless of its ultimate composition, the topographic unit appearing in the corps echelon should be assigned to the engineer command, corps, as its entire facilities normally are required to serve the corps as a whole.

e. Technical Intelligence and Photo Interpretation. These services are required by the sub-units of the corps as a whole[9], and, therefore, should appear at the corps echelon. In the European Theater they were cellular units attached habitually to corps from higher echelons. The need for them has been clearly demonstrated and these services should be continued. For increased efficiency and ease in administration they should be made an organic part of the headquarters, engineer command, corps.[9]

50. Recommendations. It is recommended that in a theater similar to the European Theater of Operations, a type corps be provided engineer organizations organized under the engineer command, corps, as shown below:

RECOMMENDED ORGANIZATION OF CORPS ENGINEER UNITS
UNDER THE ENGINEER COMMAND, CORPS



SECTION 4

ARMY ECHELON

51. Purpose. No standard system is prescribed for handling the numerous engineer units of different types present in a field army. Each army engineer has great latitude in the grouping and operation of his units. The lack of standardization in overall organization prevents thorough pre-combat training, jeopardizes coordination and compromises efficiency of operations, particularly when units are shifted between armies.[1]

52. Assumptions and Basic Principles.

a. The engineer command, army, outlined in chapter 2 will be adopted.

b. The engineer combat regiment as developed in chapter 3 will be used.

c. Units should be grouped functionally and those in each category combined under the minimum number of headquarters.

d. The army engineer should be responsible as outlined in paragraph 31b above for construction work in the army area. This construction policy fixes the responsibility that determines the proper allocation of construction units.

53. Functional Division of Activities. All army engineer activities fall under the general classification of combat support. They are divided functionally into three main categories: combat, general construction and service.

54. Combat Units. Experience in the European Theater has shown that a unit of group or regiment size (three battalions) supported by a light equipment company and a dump truck company of the present types, or two of the newly recommended combat equipment companies[12], is required to support each corps.[1] A total of three, three-battalion regiments with special units is required for this purpose by each type army. In addition the army must have an operational reserve of units to meet special situations. These could well be distributed among the three regiments. They include panel bridge transport companies, pneumatic float companies and rigid boat companies. These are necessary for special operations, to give proper support to the corps to replace losses, and for army operations.

55. General Construction Units. The construction responsibility is enunciated in paragraph 31b above. There should be no deviation from this policy except where limitations are imposed by lack of time, personnel or equipment. Two differing methods of operation in this connection were employed in the European Theater. In the zone of action of 12 Army Group railroad work and heavy bridge and general construction were performed by the Advance Section, Communications Zone, in the army areas and occasionally in the corps areas.[1] In the zone of action of 6 Army Group all construction work in the Seventh Army area was performed by army troops.[1] The former method was a deviation from the normal caused by a lack of balance of troops between communications zone and armies.[1] The latter method is considered normal and is in accordance with the construction policy stated above. The authorized army engineer troop basis for the armies under 12 Army Group did not provide for units with adequate construction capabilities to permit adherence to the construction policy. The utilization of units specifically trained and equipped for construction is more efficient than the use of combat units for that type of work. Combat units lacked the power equipment and training of construction units. To meet the construction requirements the allotment to each army of three units, each with approximately the capabilities and mobility of a construction battalion, under one construction group headquarters, is necessary.[1] This involves no change in the number of units, but in the type of units.

56. Service Units. It was necessary for army engineers to utilize an engineer combat group to control the operations of the engineer units performing service functions.[2] These functions are: Class II and IV supply, maintenance, topographic, camouflage, water supply and fire fighting. This control should be exercised by a supply group specially trained in service functions.[14,15] To the supply group headquarters the topographic battalion, water supply, firefighting units, utilities detachment, and map depot and distribution company should be attached for administration and supply only; the camouflage battalion for administration, supply and limited operations; and the balance of the service units should be assigned. There would thus be provided an effective controlling headquarters which would also act as a parent unit for

the numerous special companies and detachments. The engineer supply function of the army normally requires the operation of one main army depot and three advance (corps) dumps. This necessitates operating personnel, labor and labor supervisory personnel, guard and security personnel, and operators for transportation and loading equipment. Transportation is an important element of this service. The present engineer depot companies were found deficient in many essential aspects.[16] To overcome these defects, an engineer depot battalion is proposed.[17] A map distribution unit should be organized to eliminate the faults of the engineer map distribution system.[14,18]

57. Miscellaneous Units. A number of small cellular units normally functioned directly under the engineer as an addition to the army engineer section. These included the survey liaison team, photo interpretation team and the technical intelligence team (research). They were originally authorized in the European Theater of Operations as an expedient to overcome deficiencies in the existing tables of organization. They should be integrated into the headquarters, engineer command, army.[19]

58. Conclusions.

a. A headquarters, engineer command, army, approximating in size the present army engineer section, plus normal attached cellular units, is necessary to command army engineer units.[19]

b. The following new types of engineer units are necessary in the army echelon:

Headquarters, Engineer Command, Army.[19]
Headquarters and Headquarters Company, Engineer Supply Group.[15]
Engineer Depot Battalion.[17]
Engineer Combat Equipment Company.[12]
Engineer Map Depot and Distribution Company.[18]

c. Changes are necessary in the following engineer units normally part of the army echelon:

Engineer Panel Bridge Transport Company.[11]
Engineer Topographic Battalion, Army.[13]

59. Recommendations. It is recommended that:

a. The following new type or modified units, outlined in chapter 4, be furnished each field army:

Headquarters, Engineer Command, Army.
Headquarters and Headquarters Company, Engineer Supply Group.
Engineer Depot Battalion.
Engineer Combat Equipment Company.
Engineer Map Depot and Distribution Company.
Engineer Panel Bridge Transport Company.
Engineer Topographic Battalion, Army.

b. In a theater similar to the European Theater, a type army be provided engineer organizations as shown below:

RECOMMENDED ORGANIZATION OF ARMY ENGINEER UNITS
UNDER THE HEADQUARTERS, ENGINEER COMMAND, ARMY

Headquarters, Engineer Command, Army
(Commanded by Army Engineer)

COMBAT

Hq and H&S Co Combat Regt 3 Combat Bns 2 Combat Equip Cos 1 Panel Br Transport Co 1 Pon Br Co, Pneu Float 2 Pon Br Cos, Rigid Bt	Hq and H&S Co Combat Regt 3 Combat Bns 2 Combat Equip Cos 1 Panel Br Transport Co 1 Pon Br Co, Pneu Float 2 Pon Br Cos, Rigid Bt	Hq and H&S Co Combat Regt 3 Combat Bns 2 Combat Equip Cos 1 Panel Br Transport Co 1 Pon Br Co, Pneu Float 2 Pon Br Cos, Rigid Bt

GENERAL CONSTRUCTION

Construction Group Headquarters
3 Construction Battalions

SERVICE

Supply Group Headquarters

Assigned	Attached
1 Depot Bn	1 Topographic Bn, Army
3 Maintenance Cos	1 Map Depot and Distribution Co
3 Panel Bridge Transport Cos	1 Camouflage Bn
	1 Water Supply Co
	3 Fire Fighting Plats
	1 Utilities Detachment

SECTION 5

TROOP BASIS FOR A FIELD ARMY

60. Summary of Requirements. The foregoing recommendations are summarized in the Troop Allotment Chart in paragraph 63 below. This chart represents the entire engineer structure considered essential for a type field army.

61. Comparison with European Theater of Operations, United States Army, Troop Basis. The table shown in paragraph 64 below compares the total recommended allotments of major engineer units with the European Theater of Operations, United States Army Allotment at the close of hostilities in the European Theater. It will be noted that no critical

differences exist. The increases over the European Theater of Operations, United States Army totals are confined to the following types of units in which there was a demonstrated deficiency during operations and where improvisation had to be resorted to:

a. A headquarters for the engineer command, corps. (This replaces the present corps engineer section.)

b. Bridging.

c. Advance dump operation.

d. Map distribution.

62. Final Recommendation. It is recommended that the engineer troop basis shown in the Troop Allotment Chart (paragraph 63) be approved for a type field army.

63. Recommended Troop Allotment Chart Including Basis for Changes.

ENGINEER TROOP BASIS[c]

UNIT	T/O & E	INF DIV	ARMD DIV	ABN DIV	CORPS OF 4 DIV[a]	ARMY OF 3 CORPS	INCREMENT FOR EACH ADDITIONAL		
							INF DIV[d]	ARMD DIV	CORPS
COMBAT UNITS									
Hq, Engr Cmd, Army[b]	5-					1			
Hq & Hq Co, Engr Cmd, Corps[b]	5-				1				
Engr C Regt[b] (Div)	5-	1							
Armd Engr Regt[b]	5-		1						
Abn Engr Regt[b]	5-			1					
Engr C Regt, (Corps & Army)	5-				2	3	1		1
Engr C Bn	5-15				6	9	3	1	3
Engr Maint Co	5-157				1	3			
Engr C Equip Co[b]	5-				2	6	1		2
Engr Pon Br Co, Rigid Boat	5-297					6			2
Engr Panel Br Trans Co	5-287				2	6	1	1	2
Engr Pon Br Co, Pneu Float	5-627				2	3	1	1	1
Engr Topo Co, Corps	5-167				1				
Engr Cam Bn	5-95					1			
SERVICE UNITS									
Hq & Hq Co, Engr Supply Gp[b]	5-					1			
Engr Depot Bn[b]	5-					1			1[e]
Engr Water Supply Co	5-67					1			
Hq & Hq Co, Engr Cons Gp	5-72					1			
Engr Cons Bn	5-75					3			
Engr Topo Bn, Army	5-55					1			
Engr Fire Fighting Plat	5-500					3			1
Engr Map Dep & Dist Co[b]	5-					1			1[f]
Engr Utilities Detachment	5-500					1			

NOTES:

a. Each corps consists of three infantry and one armored divisions.
b. New units proposed by General Board.
c. Numbers do not include units assigned to components; i.e. Corps figures do not include divisions.
d. Provided for first and second divisions only (none for third).
e. Dump operating company only.
f. Map distribution section only.

64. Comparison of Recommended Allotment to European Theater of Operations, United States Army Allotment at End of Hostilities.

Type Unit	Recommended Allotment	ETOUSA Allotment	Changes	
			Plus	Minus
Hq & Hq Co, Engr Comd, Corps	3	0	3	
Group or Regiment Hq	11	12		1
Combat, Construction or GS Bn	30	33		3
Light Equipment Co) Combat Equipment Co)	12	7½		½
Dump Truck Co)		5		
Panel Br Trans (L Pon) Co	12	8	4	
Pon Br Co. Pneu Float (Tdwy Co)	9	6½	2½	
Pon Br Co, Rigid Bt (Hv Pon Co)	6	5	1	
Topographic Co, Corps	3	3		
Maintenance Co	6	6		
Depot Bn - Depot Operating Co	1	1½		½
Dump Operating Co	3	0	3	
Topographic Bn, Army	1	1		
Map Depot and Distribution Co	1	0	1	
Camouflage Bn, Army	1	½	½	
Water Supply Co	1	2		1
Fire Fighting Platoon	3	2½	½	
Utilities Detachment	1	1		

BIBLIOGRAPHY

Chapter 5

1. File 320.2/36, "Engineer Organization", Engr Sec, The General Board, US Forces, European Theater.

2. 1st Ind., dated 24 April 1945, by Engr, Third US Army, to letter from Engr, 12 Army Group, file EO 322. GNMCR - 3, subject, "The Group versus the Regiment - Engineers", dated 19 March 1945.

3. File 320, Engineer Operations, Office of the Chief Engineer, European Theater of Operations, subject, "Group versus Regiment -- Engineers".

4. Letter, Hq Fifteenth US Army, file 319.1 GNMEN, subject, "Engineer Final Report", dated 7 July 1945.

5. WD Observers Board, Hq European Theater of Operations, AGF Report No. 1138, by Colonel Chester C. Hough, CE, subject, "Comments of an Army Engineer", dated 31 July 1945.

6. Machine Records Unit, United Kingdom and Continental Station List, European Theater, 15 April 1945.

7. Chapter 2 (Engineer Command).

8. WD Observers Board, Hq European Theater of Operations, AGF Report No. 1149, by Colonel Chester C. Hough, CE, subject; "Final Report of Colonel Chester C. Hough, CE, Engineer Observer, ETO", dated 31 July 1945.

9. File 337, Conferences, Engr Sec, The General Board, US Forces, European Theater.

10. Chapter 3 (Group versus Regiment).

11. Appendix 5, Chapter 4, (Engineer Panel Bridge Transport Company).

12. Appendix 4, Chapter 4, (Engineer Combat Equipment Company).

13. Appendix 6, Chapter 4, (Engineer Topographic Units).

14. Report of Engineer, Seventh US Army, subject, "Lessons Learned During Operations in France and Germany", dated 12 July 1945.

15. Appendix 8, Chapter 4, (Engineer Supply Group).

16. WD Observers Board, Hq European Theater of Operations, AGF Report No. 901, by Colonel Chester C. Hough, CE, subject, "Recommendations of an Army Engineer", dated 5 May 1945.

17. Appendix 9, Chapter 4, (Engineer Depot Battalion).

18. Appendix 10, Chapter 4, (Engineer Map Depot and Distribution Company).

19. Appendix 7, Chapter 4, (Headquarters, Engineer Command, Army).